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SMITHSONIAN MISCELLANEOUS COLLECTIONS

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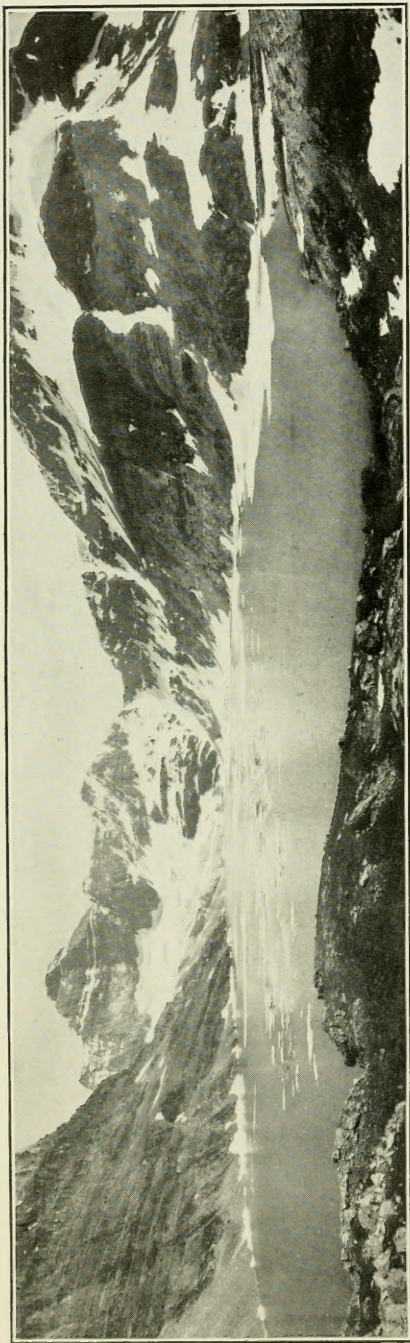
EXPEDITIONS ORGANIZED OR PARTICI-
PATED IN BY THE SMITHSONIAN
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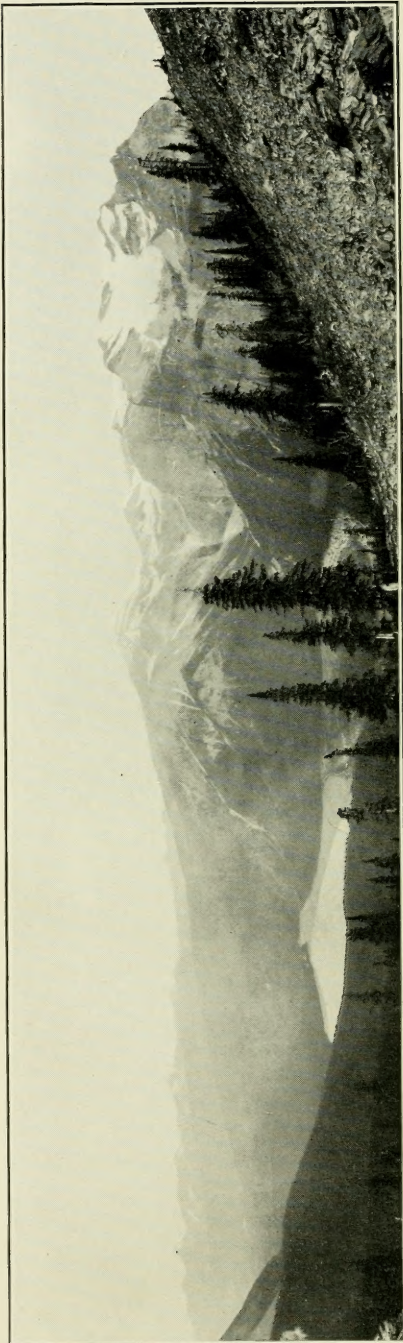
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LAKE McARTHUR AND SURROUNDING MOUNTAINS NEAR HECTOR, BRITISH COLUMBIA. SEE PAGE 39



PRESIDENT RANGE, EMERALD LAKE, AND VAN HORN RANGE, NEAR FIELD, BRITISH COLUMBIA. SEE PAGE 44

EXPEDITIONS ORGANIZED OR PARTICIPATED IN BY
THE SMITHSONIAN INSTITUTION
IN 1910 AND 1911.

The Smithsonian Institution has been concerned in numerous scientific expeditions and collecting trips during the last two years. Some of these were new enterprises, while others were for the continuation of work initiated in earlier years. The resources of the Institution not being sufficient to enable it to plan extensive investigations in the field, or to maintain a corps of collectors, it is compelled to concentrate its efforts on special work of limited scope, but of such a character that the results shall, as far as possible, have an immediate bearing on the progress of science. In recent years, as in the whole of its past history, the Institution has had the aid of public-spirited citizens and the coöperation of other institutions and of the several branches of the United States government. It has, in turn, coöperated with other organizations in the explorations which they have conducted, being itself benefited thereby and benefiting those with which it has been associated.

The National Museum has participated in most of these enterprises, sometimes furnishing equipment or supplies, and at other times detailing members of its scientific staff to conduct investigations or to make collections.

In recent years, opportunities have been afforded for participating in exploring and hunting expeditions organized by private enterprise, whereby scientific collections of great importance have been obtained. These collections, with those from other sources, are preserved in the National Museum for exhibition to the public, or for promoting scientific studies.

The field of these activities of the Institution has been world-wide, but in the last two years attention has been concentrated on Africa rather more than on any other region. Scarcely had the Smithsonian African Expedition returned from the field, with its great zoölogical collections, than another opportunity occurred through the generosity of Mr. Paul J. Rainey, of New York, to secure specimens for the National Museum from the same region to supplement and to supply deficiencies in the earlier collection.

MR. PAUL J. RAINEY'S EAST AFRICAN HUNTING-TRIP

Mr. Rainey planned a hunting-trip of several months' duration, the principal object of which was to test the possibility of hunting lions with American bear-hounds. He offered to present to the Institution the natural-history material obtained while he was in the field, provided some person skilled in the preservation of specimens for scientific purposes could be sent with him. The choice fell on Mr. Edmund Heller, who, on account of his extensive experience as one of the field naturalists of the Smithsonian African Expedition, was well fitted to take charge of any zoölogical collections that might be made.

The expedition left New York February 18, 1911, and Mr. Heller turned homeward from Nairobi, British East Africa, about February 15, 1912, so that almost exactly a year was spent in the enterprise. The route of travel was somewhat to the north and east of that taken by the earlier Smithsonian Expedition, and passed through the country lying between the northern part of British East Africa and southern Abyssinia.

Arrived at Mombasa, the expedition took its way toward the north, across the Gabba Plains district, along the east side of the Horerti and Koroli deserts, by the Lorain swamp, and thence along the west side of the desert to Nairobi.

The coast stations of the Uganda railroad were then visited by Mr. Heller, and afterwards various localities about Lake Victoria Nyanza.

The Institution received on September 9, 1911, the first consignment of specimens, consisting of some 300 skins of large mammals, 400 skins of small mammals, and a variety of other zoölogical material. Mr. Heller estimated that the collection as a whole would compare favorably in size with that made by the Smithsonian African Expedition, and that it comprised about 700 skins of large mammals, 4,000 skins of small mammals, together with a large number of birds and reptiles. Most of the material is from regions not covered by the earlier expedition, and some of it is from remote localities never before visited by naturalists.

In the first lot of birds received, was found a new species which has been described by Dr. E. A. Mearns, under the name of Rainey's Wedge-tailed Sunbird. Other novelties will doubtless be found when the whole collection of birds and mammals has been studied.

MR. CHILDS FRICK'S EXPEDITION TO ABYSSINIA AND BRITISH EAST AFRICA

While Mr. Rainey's party was still in the field, another African expedition was organized by Mr. Childs Frick of New York. Mr. Frick's object was to make as complete a collection as possible of the animals of certain parts of Abyssinia and the adjacent territory, including the northern portion of British East Africa, somewhat north of the region traversed by Colonel Roosevelt in 1909-10, and Mr. Rainey's expedition. It is his intention also to visit the neighborhood of Lake Rudolf and to work along the shores of the lake itself, as this region has been but little explored since Count Teleki first visited it in 1888.

Mr. Frick took with him Dr. E. A. Mearns, who had been with the earlier Smithsonian Expedition; also a friend, Mr. Blick, and a physician. From a recent letter written by Dr. Mearns it has been learned that the party proceeded to Aden, and then crossed to Jibuti on the coast of French Somali-Land, whence they proceeded by rail to Dire Daoua in Abyssinia. At this point they left the railroad and followed the road by Herer (or Herrer) to Adis Abeba, the capital of Abyssinia.

Mr. Frick very generously offered to present half the birds collected to the National Museum, and a first consignment comprising several hundred specimens has already been reported by Dr. Mearns as ready for shipment.

SMITHSONIAN ASTROPHYSICAL OBSERVATIONS IN ALGERIA

An African expedition of quite different character was sent out from the Smithsonian Astrophysical Observatory in July, 1911, to Algeria. This was for the purpose of making observations on the radiation of the sun. The party consisted of Mr. C. G. Abbot, Director of the Observatory and Prof. F. P. Brackett of Pomona College. They sailed from New York, taking with them 32 cases of equipment, and on July 25, landed at Algiers where great aid was rendered by Monsieur René L. J. Boisson, Vice-Consul of the United States. Free entry of the equipment was granted by the French government. By the advice of Director Gonnessiat, of the Observatory of Algiers, it was decided to locate on the plateau some 50 to 100 miles directly south of Algiers. Mr. Abbot had the good fortune to meet Director Mestral of the École Roudil, near Ben Chicao, to obtain from him permission to observe from a hill situated about $\frac{1}{4}$ mile east of a little hamlet called Bassour, and to live in a 4-room stone farm-house in

Bassour, belonging to the École Roudil. The observing station was located in latitude $36^{\circ} 13' 20''$ N., longitude $2^{\circ} 51' 30''$ E., at an elevation of 1,160 meters.

With the exception of one French family, all the neighbors during most of the four months' stay were Arabs. A screen-door added to the house by the Americans to hinder the entrance of house-flies, proved to have a no less valuable effect in keeping out uninvited visitors. Ancient methods of agriculture prevail in this region. Wheat is the staple crop. The ploughing is done with wooden



FIG. 1.—Observing station in Bassour. Photograph by Abbot.

ploughs, and the grain is threshed by treading out with oxen or mules, just as probably was done in the same country thousands of years ago.

The ménage for the party was in the hands of Mrs. Abbot, who accompanied her husband, and doubtless owing to this circumstance no sickness of any kind occurred while the observers were in the field.

A complete spectrobolometric outfit was erected, including a small dark-room shelter for the photographic recording galvanometer. This shelter was built by Messrs. Abbot and Brackett out of packing boxes. The apparatus was the same that Mr. Abbot had used in 1909, and 1910, in his brief expeditions to the summit of Mount Whitney,

California (4,420 meters). It is rather a new departure with the bolometer, that delicate instrument which measures the millionth of a degree rise of temperature, to use it out of doors, following the sun in an equatorial telescope, but Mr. Abbot successfully used it so in 1908 at Flint Island in the South Pacific, in 1909 and 1910 at Mount Whitney, and now for several months in 1911 in Algeria.

A delay of about 2 weeks occurred in beginning observations, owing to the miscarriage of one of the cases of apparatus. Considerable cloudy weather unfortunately prevailed in September and October, both at Bassour and at Mount Wilson, California, where Mr. L.

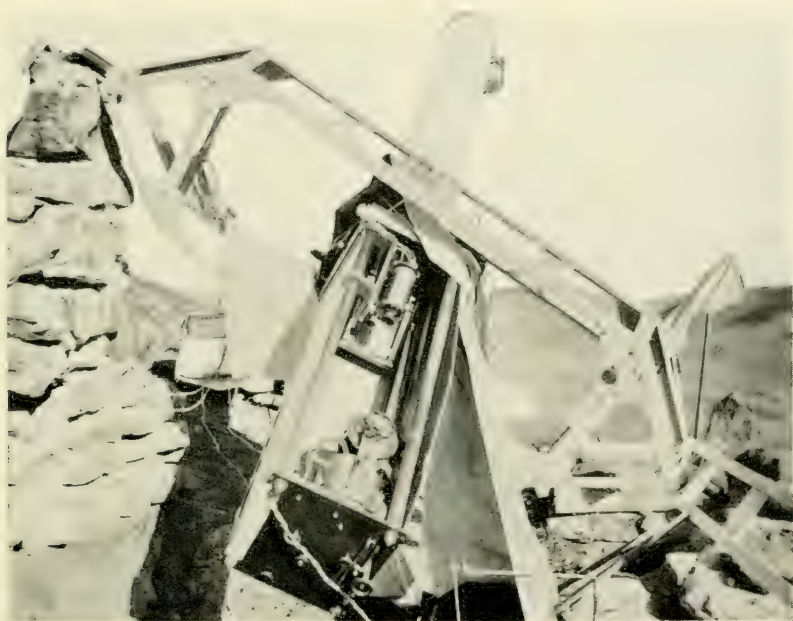


FIG. 2.—Spectrobolometer. Photograph by Abbot.

B. Aldrich was conducting similar observations. Messrs. Abbot and Brackett observed on 44 days at Bassour, and discontinued observing on November 18. Mr. Aldrich observed on 29 of these days at Mount Wilson, and secured observations for about four more which will be useful for the comparison of results between the two stations. It takes about three days of computing to reduce one day's observations, so that the final results of the work are not yet known. If further experiments are necessary, it is hoped to make them at the same stations in June, July, and August of 1912.

Recent experiments of the Smithsonian Astrophysical Observatory made principally at Mount Wilson, California, in the years 1905 to

1910, had strongly indicated that the sun is really a variable star. The fluctuations in the amount of solar radiation seem to be of magnitudes seldom exceeding 5 per cent, but to occur in irregular periods of 5 or 10 days. It is not easy to predict just what effects such changes in solar radiation would produce on terrestrial climate, but that they must have some influence, and quite possibly a notable one, seems highly probable. Hence if the supposed solar changes are real, it will doubtless be necessary for meteorological purposes as well as for general interest to observe the sun regularly at all times of the year, in order to detect and record its variations.



FIG. 3.—Extra observers. Photograph by Abbot.

But before going to the expense of such additional observing equipments as will be necessary for daily measuring the solar radiation, it is indispensable to prove definitely that the sun really varies. While the Mount Wilson work seems to recommend this conclusion very strongly, it is not perhaps impossible that local atmospheric conditions may have had some influence there, so that what seems most likely to have been solar changes may possibly have been of atmospheric origin. To exclude this possibility it is necessary to show that the same results would be reached by simultaneous observations at another station far from Mount Wilson.

The station at Washington is unsuitable for this purpose because clouds so often interfere. A station near the city of Mexico was proposed and would have been occupied in July, but just as definite arrangements were being concluded the town where the expedition was to locate was reported sacked by a war party. As the conditions in Mexico seemed likely to remain disturbed for some time, another part of the world was chosen. Considerations of accessibility, favorable climate, high altitude, and peaceful conditions, seemed to recommend Algeria.

Such of the Algerian observations as have been thus far completely



FIG. 4.—Arab judge. Photograph by Abbot.

reduced seem to be very promising and indicate that the expeditionary measurements were equally as definitive as those made at the permanent station on Mount Wilson. Great confidence is felt, that, as a result of the present expedition, supplemented if necessary by the continuation of it in 1912, a satisfactory conclusion will be reached as to the supposed variability of the sun.

Returning, Mr. Abbot visited Naples, Potsdam, London, and Paris, for the purpose of comparing the silver disk pyrheliometers furnished by the Institution to observers in those cities, with a similar instrument used by the expedition in Algeria. Comparisons were made satis-

factorily in Naples and Potsdam, but clouds prevented them in London and Paris.

INVESTIGATION OF THE ANTIQUITY OF MAN IN SOUTH AMERICA

In March, 1910, Dr. Aleš Hrdlička, Curator of the Division of Physical Anthropology in the National Museum, went to Argentina on behalf of the Institution for the purpose of making an investigation into the question of man's antiquity in that part of the world. A grant was also made to enable Mr. Bailey Willis, of the United States Geological Survey, then proceeding to South America in the interest of the world's topographical map, to coöperate with Doctor Hrdlička, as it was appreciated that the problems to be met with were, to an important degree, of a geological nature. The undertaking was suggested by Mr. William H. Holmes, whose observations during a visit to Argentina in 1908 made apparent the far-reaching importance of the data bearing on human antiquity in South America then being assembled.

The inquiry into man's antiquity in South America dates from the meager reports concerning the scattered remains in the Lagoa Santa caves in Brazil, the casual Seguin finds in the province of Santa Fé, Argentina, and the Moreno collection of old Patagonian material from the valley of the Rio Negro. It has assumed a special importance during the last decade, through a relatively large number of reports by Argentinian investigators (particularly by the late Florentino Ameghino) of new finds of remains of ancient man and of traces of his activities. Some of the more recent finds were so interpreted that, if corroborated, they would have a most important bearing not merely on man's early presence in the South American continent, but on the evolution and the dispersal of mankind in general.

The Smithsonian representatives received from the Argentine government and from scientific men of that country all necessary facilities for the examination of the specimens preserved in various institutions and for the prosecution of their field-work. The late Prof. Florentino Ameghino and his brother, Carlos, gave special aid to the undertaking, accompanying Dr. Hrdlička and Mr. Willis personally for over three weeks along the coast from place to place where the supposedly ancient remains were discovered.

The researches occupied nearly two months. Every specimen relating to ancient man that could still be found was examined and every locality of importance where the finds were made was visited

and investigated. The evidence gathered does not sustain a large part of the claims that have been made. The human bones and the archeological specimens which should represent races geologically ancient agree in all important characteristics with the bones and work of the American Indian; and the finds, so far as observed, while often in close relation with early quaternary or tertiary deposits, are only intrusive. Furthermore, the original sources of some specimens that present certain morphological peculiarities are not so well established that scientific deductions of great consequence can be safely drawn therefrom.

The expedition secured numerous geological, paleontological, and anthropological specimens, some of which throw much light on the question of the antiquity of the finds to which they relate. These specimens are being identified and described in the National Museum, and in due time Dr. Hrdlička and Mr. Willis will present a detailed report on their investigations.

ANTHROPOLOGICAL RESEARCHES AT PACHACAMAC, PERU

Following the researches in Argentina, Dr. Hrdlička visited the great ruins of the temples and city of Pachacamac, about 18 miles



FIG. 5.—View of the Sun Temple, Pachacamac, from northeast.

south of Lima, and also the ruins and cemeteries in the district of Trujillo, Peru, where he collected upward of 3400 crania and a quantity of other skeletal parts. A large percentage of the gathered skulls are free from artificial deformation and therefore afford a much better opportunity than previous collections for a critical study of the peoples who centuries ago occupied and congregated in these regions.

Pachacamac was a religious center, much like the Egyptian Thebes and the Mohammedan Mecca, to which pilgrims flocked from all parts of Peru. After the destruction of the Temple of the Sun by the Spaniards, the place became a desolate pile of ruins with from

60,000 to 80,000 graves of pilgrims who had come from widely separated regions. The valley of Chicama, near Trujillo, with the neighboring country, was the seat of the powerful people known after one of their chiefs as Chimú.



FIG. 6.—View of the southwestern part of Pachacamac, from the north.



FIG. 7.—Figure cast from a mold found in the valley of Chicama, Peru.

As to the importance of the material collected, Dr. Hrdlička remarks:

“Peru may well be regarded, even in its present territorial restrictions, as the main key to the anthropology of South America. Due to the numbers of its ancient inhabitants, and to their far-reaching social differentiations, indicating long occupancy, a good knowledge of the people of Peru from the earliest times is very desirable, and would constitute a solid basis from which

it would be relatively easy to extend anthropological comparison to all the rest of the native peoples of the southern continent. Such anthropological comparisons will be greatly facilitated by the collections acquired on this expedition."

Some of the interesting results of his work are described by Dr. Hrdlička in a pamphlet recently published by the Institution.

THE AZTEC VILLAGE OF XOCHIMILCO IN MEXICO

While returning from his explorations in Peru, Dr. Hrdlička stopped at the City of Mexico and made an interesting trip to an old Aztec village about 15 miles distant, on the shores of Lake Xochimilco, or the "Place of Flowers," one of the few old Aztec towns in existence to-day.

The village nestles on the shore of the lake and is inhabited by perhaps a thousand people,

mostly Aztecs. It is far surpassed in interest by the lake itself, and the many cultivated islands it contains. The development of these islands is peculiar and unique, and yet is very simple from an engineering point of view. It appears that many years ago some of the early natives conceived the idea of building islands, which they called "chinampas," by sinking bound bundles of reeds so as to form rafts upon which earth and alluvial soil were placed, and on this more bundles of reeds were piled until actual islands began to appear. Sometimes when these islands needed reinforcement to prevent their washing away, or caving in, willows were planted near the shores to form a firm bank and boundary. The islands, of course, gradually sank from year to year, but after being covered over with alternate layers of soil and reeds, a more substantial piece of land was formed, which was capable of cultivation.



FIG. 8.—Clay figure from an old native grave in the valley of Chicama, Peru.

There are many of these artificial islands varying in size from 40 to 120 feet square, planted with flourishing crops of corn, vegetables, and flowers. Altogether, they present a scene of remarkable



FIG. 9.—Artificial islands (Chinampas), Xochimilco, Mexico. Photograph by Hrdlička.



FIG. 10.—Native houses, Xochimilco, Mexico. Photograph by Hrdlička.

beauty and great delight to the visitor, a real earthly paradise. Laid off, as they are, in a regular manner, each an individual blossoming garden, separated from its fellows by canals or water lanes, through which pass the canoes and dugouts of the natives on the way to and

from the market, they have a Venetian appearance that is most attractive.

New islands are constantly being constructed and repaired to-day, just as when the enterprise began years ago. The Aztecs hold the town and lake in their own right. It is not only a thrifty, but a most artistic little settlement, the homes and houses on the shore, the farms and fields in the lake. Corn and all vegetables raised on these island-fields are of the best quality.

In carrying out his anthropological work, Dr. Hrdlička made careful studies of the natives, securing six plaster casts of Aztec heads, one of which was a woman, an excellent type of the modern aborigines.

THE RUINS AT SAN JUAN TEOTIHUACAN IN MEXICO

While in Mexico, Dr. Hrdlička was invited by the government to open a sepulcher at the great ruins of San Juan Teotihuacan, some 25

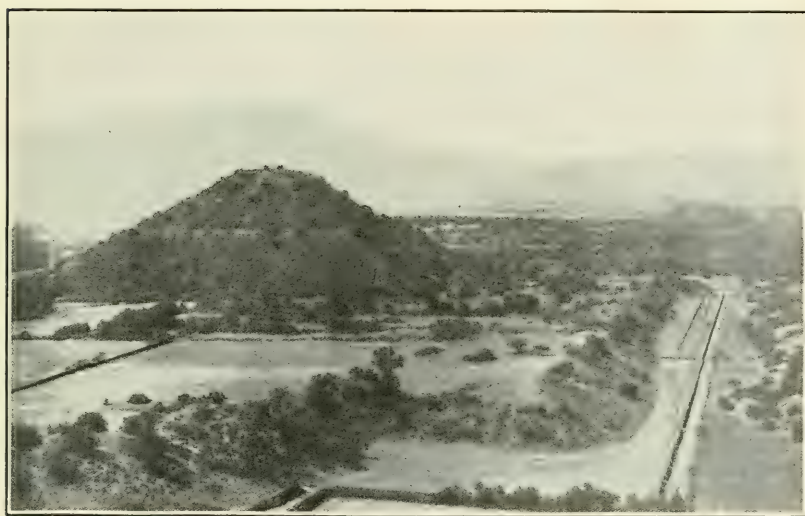


FIG. 11.—Teotihuacan. View of the Pyramid of the Sun from the north and west before excavation.

miles northeast of Mexico City. These ruins, which comprise two very large pyramids, known as the Pyramid of the Sun and the Pyramid of the Moon, are being cleared and restored by the government with most interesting results. The grave opened by Dr. Hrdlička proved to be one of extraordinary interest. It was situated about 250 yards southeast of the east-southeast corner of the Pyramid



FIG. 12.—View of the Pyramid of the Moon and "road of dead." Excavated dirt shows entrance to tunnel extending toward interior about 90 feet. This tunnel is cross cut and the right hand cut terminates in a shaft built into the center of the pyramid vertically.

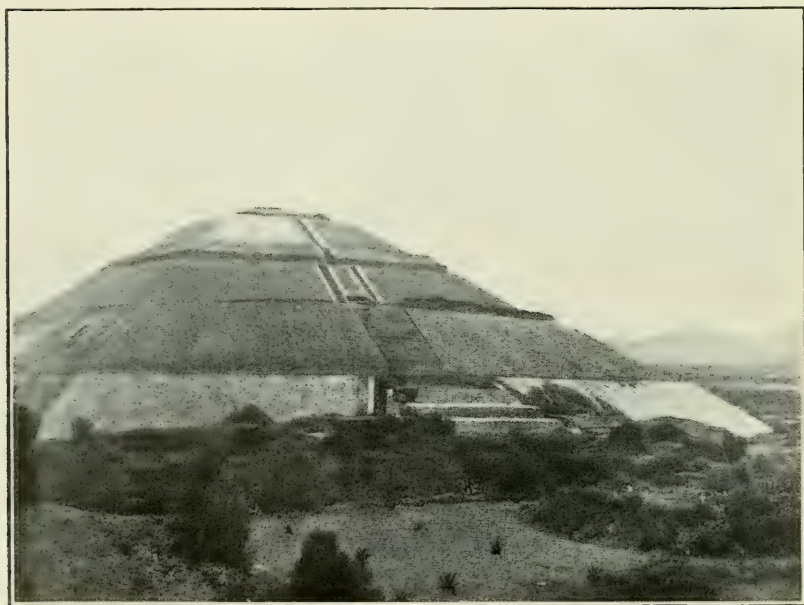


FIG. 13.—Teotihuacan. View from the west of the Pyramid of the Sun after excavation.

of the Sun, and about 20 feet north of the track of the local railroad where there was a large level piece of ground without ruins. The workmen had opened a long exploratory trench through this tract, parallel with the railroad. In an urn-shaped cavity Dr. Hrdlička found the skeletons of a man and a woman, and various dishes, rugs, and knives. The skulls were artificially deformed. These objects were deposited in the museum at San Juan. The interest in this find lies, according to Dr. Hrdlička, in "the peculiar construction of the grave," "the fact that here were buried together an adult man and an adult woman, which suggests the sacrifice of the woman on the occasion of the death of her husband," what appears to be "a clear evidence that the artificial head-deformation of the flathead type was actually practised by at least a part of the ancient inhabitants of these regions," and the evidence that "the ancient builders of Teotihuacan, or, at least, an important part of them, were of the brachycephalic type."

SMITHSONIAN BIOLOGICAL SURVEY OF THE PANAMA CANAL ZONE

The Institution in 1910 organized a biological expedition whose objective point was the Panama Canal Zone. It was undertaken at the urgent solicitation of naturalists at home and abroad, who felt that with the opening of the Panama Canal the natural conditions of the fauna and flora of the land-bridge between North and South America would be disturbed to such a degree as to complicate the problems of geographical distribution in this important region. The means of the Institution were insufficient to permit it to undertake the field-work required, and it was not until they were augmented by the generosity of friends that the expedition could be seriously considered. When this pecuniary aid had been supplemented by the coöperation of the departments of the government, the success of the undertaking was assured.

A letter was addressed to the President outlining the plan, and inquiring whether it would meet his approval if the several executive departments of the government were requested to coöperate in the enterprise. The President gave his approval and authorized the secretary of the Institution to communicate with the departments. All those that were addressed signified their desire to coöperate and assigned experts to aid in the work.

The Institution is indebted to the Department of State, the Department of Agriculture, the Department of Commerce and Labor, and the War Department for courtesies which have made the expedition



FIG. 14.—Choco Indian of Southern Darien, Panama. Photograph by Pittier.



FIG. 15.—Cura Indian women and children from Urgandi, Coast of San Blas, Panama. Photograph by Pittier.

a success. Special mention should be made of the assistance rendered by the officers of the Isthmian Canal Commission and the Panama Railroad Company, which was extended with much liberality and was of the highest importance in promoting the interests of the undertaking.

The Field Museum of Natural History, Chicago, having planned for the collection and study of the fishes of the Canal Zone, this work was by agreement carried on in conjunction with that of the Smithsonian Expedition.

It was at first proposed to confine the collections to the Canal Zone, but as the natural faunal and floral areas extended much to the north and south, it was found necessary to extend the work into the territory of the Republic of Panama. The government of Panama not only gave the necessary permission, but expressed a strong desire that as much work as possible should be done within its limits, and aided the collectors in every way possible.



FIG. 16.—Tropical thicket, with epiphytic vegetation on Cerro Azul, near Canal Zone. Photograph by Goldman.



FIG. 17.—Party crossing the Savannas northwest of Chepo, Panama, on the way to the mountains at the head of Chagres River. Photograph by Goldman.

The work done in the season of 1910-1911, related to vertebrate animals, land and fresh-water mollusks, and plants, including flowering plants, grasses, and ferns. The work on mammals and birds was carried on by Mr. E. A. Goldman of the Biological Survey of the U. S. Department of Agriculture; on reptiles, batrachians and fishes, by Prof. S. E. Meek of the Field Museum of Natural History, Chicago, and Mr. S. F. Hildebrand of the Bureau of Fisheries of the U. S. Department of Commerce and Labor; on insects, by Messrs. E. A. Schwarz and August Busck of the Bureau of Entomology, U. S. Department of Agriculture; on flowering plants, by Prof. H.



FIG. 18.—Goldman party ascending the bed of a stream on the way into the mountains at the head of the Chagres River, Panama. Photograph by Goldman.

Pittier of the Bureau of Plant Industry, of the same department; on grasses, by Prof. A. S. Hitchcock, of the same bureau; and on ferns, by Mr. W. R. Maxon of the U. S. National Museum.

Mr. Goldman left Washington late in December, 1910, and arrived in the Canal Zone on the 28th of that month. He spent the following six months mainly in the Zone, giving special attention to the Gatun Lake area, where a luxuriant tropical forest will be replaced by a large lake. He reported that great changes, due to flooding, were already observable and that still greater ones were impending. The killing

effect of the water on the standing timber was already very noticeable, most of the trees rotting and falling in a remarkably short time. In March he made a trip to Chepo, some 40 miles to the east of the Canal Zone, and then proceeded overland to the region near the headwaters of the Chagres River where the mountains are about 3000 feet



FIG. 19.—Part of tropical forest being flooded in the Gatun Lake area. This will be entirely submerged when the lake is filled. Photograph by Goldman, 1911.

in height and present conditions not found in the Zone. The summits and northern slopes of the mountains are covered with a rich growth of orchids and plants of the order Bromeliaceæ, which grow both on the ground and on the branches of the trees. The south side of the mountains is covered with a dry forest. In May and June, Mr. Goldman visited Porto Bello on the Caribbean coast of Panama,



FIG. 20.—Boat landing on shore of Gatun Lake, Canal Zone. Photograph by Goldman.



FIG. 21.—Abandoned Lion Hill R. R. Station—the type locality of many species of birds and plants. This part of the railroad will be submerged when Gatun Lake is filled. Photograph by Goldman.

some 22 miles northeast of Colon, where the rainfall exceeds that of any part of the Canal Zone. He crossed the swamps and waded some 10 miles up the Cascajal River to the upper slopes of the Cerro Brujo, at an altitude of about 2,000 feet. As a result of the work over 2,000 birds, nearly 400 mammals, and 160 reptiles and batrachians were obtained, together with numerous photographs and notes on the habits and distribution of various species.

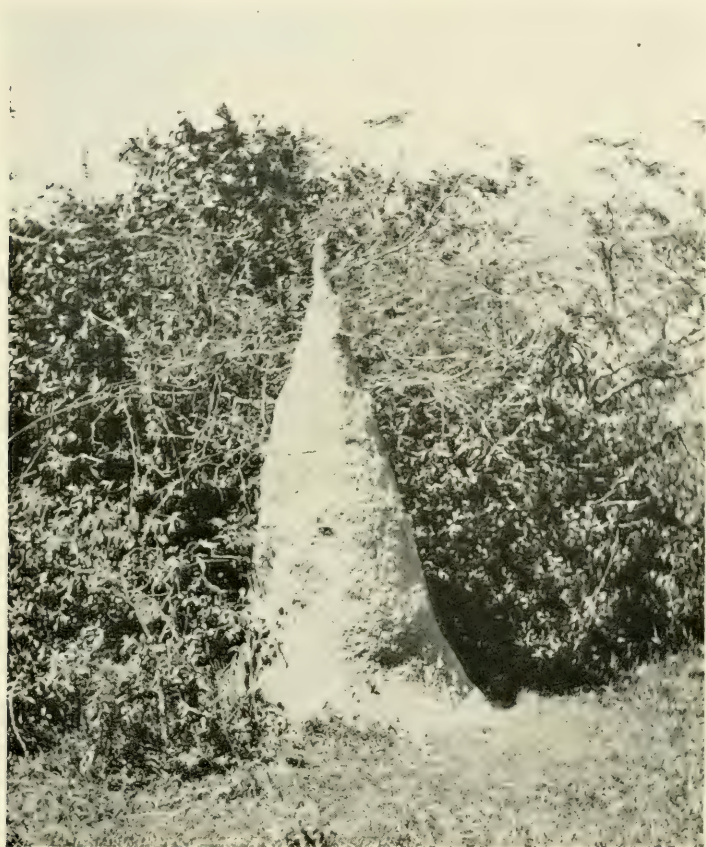


FIG. 22.—Termite nest, near Aguadulce. Photograph by Pittier.

Dr. Meek and Mr. Hildebrand were in the field from January to May, 1911. They occupied themselves principally in collecting the fishes of the fresh waters of the Zone, especially in the Gatun Lake area, and also species of the brackish waters, which it is believed will be among the first to pass through the canal. They also visited the Bayano River on the Pacific side of the Isthmus, about 45 miles to the east of the Canal Zone. A number of species of fresh water

fishes of the Isthmus were originally described from specimens taken in this river. Collections were also made in the Grande River near



FIG. 23.—Across the harbor at Porto Bello. Photograph by Pittier.



FIG. 24.—Chiriqui Volcano. Southernmost peak. Photograph by Pittier.

the Pacific entrance of the Canal, and in the Chorrera River, some 15 miles westward of the town of Panama.

The entomologists, Messrs. Schwarz and Busck, made their headquarters at Paraiso, where the fauna and flora had been but little disturbed by the work on the canal, and besides collecting along the



FIG. 25.—Cavanillesia-tree, a striking feature of the Canal Zone forest.
Photograph by Pittier.

Trinidad River, where they found a rich insect fauna, and in other areas in the Gatun Lake region, they made excursions to Porto Bello and to Nombre de Dios in the Republic of Panama, the latter place

about 35 miles east of Colon. Afterwards they made a trip up the Chagres River, and also to the Island of Taboga in the Bay of Panama, and finally to Cabima, a place on the Pacific side of the Chagres River region.

At the inception of the Smithsonian Biological Survey of the Panama Canal Zone, the botanical part of the investigation was entrusted to Prof. Henry Pittier, of the U. S. Department of Agricul-



FIG. 26.—Tropical jungle, along Panama R. R. Photograph by Hitchcock.

ture, who was detailed for this work by the secretary of that department. Prof. Pittier, who was for many years Director of the Instituto Físico-Geográfico Nacional of Costa Rica, was regarded as peculiarly fitted for this position by reason of his familiarity with the flora of Central America and his wide knowledge of the physiography and plant associations of the region. He left Washington for the Canal Zone in December, 1910, and remained in the field for more than a year. On February 3, 1911, he was joined by Mr. William R. Maxon, of



FIG. 27.—Picachos de Ola (1,969 ft.), in Eastern Veraguas. Photograph by Pittier.



FIG. 28.—Tall grasses, Mindi, Canal Zone. Photograph by Hitchcock.

the Division of Plants in the National Museum, who had been detailed to assist in the work with the main object of collecting ferns and lower cryptogams. Extensive collections were made in the Canal Zone by both these botanists, from Culebra as headquarters along the fifty-mile stretch of the Panama Railroad, various trips being made into the surrounding jungle and forest. Several days were spent also in the region of Porto Bello, on the Atlantic Coast, to the east of the Canal Zone. The most interesting trip undertaken was one of between five and six weeks' duration to the mountain region of Chiriqui, that portion of Panama adjacent to Costa Rica, and a region almost wholly unexplored botanically. The month of March was spent here, with headquarters at the small town of El Boquete which lies at the immediate southern base of the interoceanic divide. From this point several trips were made to the higher peaks, including the ascent of the Chiriqui Volcano, an isolated peak of over 11,000 feet, not previously visited by botanists. The region is especially rich in ferns, and much valuable material was secured, a considerable number of the species being hitherto unreported from Panama.

Mr. Maxon returned to Washington on April 18, accompanied by Prof. Pittier, who returned to Panama about May 1, and continued his investigations there until Feb. 29, 1912.

A large part of the work thus far accomplished has been necessarily of a preliminary character. Enough has been done, however, to indicate very clearly that an adequate investigation of the flora of Panama as a whole must of necessity extend over a period of several years. The reasons for this lie not only in the diversity of the plant associations, but also in the great number of species encountered in most localities and the need of studying many of these (particularly the trees) at different times in order to secure specimens illustrating seasonal changes.

NATURAL HISTORY OBSERVATIONS IN LOWER CALIFORNIA

The National Museum participated in another expedition to Mexican territory in 1911. Beginning in the latter part of the winter of 1910-1911, the Bureau of Fisheries in conjunction with the American Museum of Natural History, which paid a part of the expenses, conducted an exploration along the west coast of Mexico, the steamer *Albatross* being used for the purpose. By invitation, the National Museum detailed two members of its staff to participate in the expedition, Dr. J. N. Rose, Associate Curator of Plants, and Dr. Paul Bartsch, Assistant Curator of Mollusks.

The *Albatross* left San Diego, California, February 28, 1911, visited Guadalupe Island, and then proceeded down the coast of Lower California to the Gulf of California, which was traversed as far north as Angel de la Guarda Island. Dredgings were made off the outer coast of Lower California, both going and returning, and shore and shallow water collecting was carried on in the Gulf. Owing to the short duration of the cruise, somewhat less than two months, it was impossible to make more than a brief stop at any place, but nevertheless, the results of the trip were exceedingly satisfactory. Of marine invertebrates, especially mollusks, a large and fine series was obtained, and of plants, about 2,000 herbarium specimens and 1,000 living specimens, mostly cacti, were secured.¹



FIG. 29.—Dr. Bartsch collecting at low tide in San Francisquito Bay, Lower California. Steamer "Albatross" in distance.

FIELD WORK OF THE BUREAU OF AMERICAN ETHNOLOGY

It would be impossible in this brief review of Smithsonian explorations to summarize the extensive field operations of the Bureau of American Ethnology. This is, indeed, made unnecessary from the fact that they are already mentioned in some detail by the Ethnologist-in-charge, in the reports of the Secretary of the Institution for 1910 and 1911.

Researches were carried on during the year 1910, among the Pueblos, Winnebago, Blackfeet, Northern Cheyenne, Northern Arapaho, Coos, Piegan, and Omaha Indians. Investigations were

¹ (Report U. S. Nat. Mus. for 1911, p. 44.)



FIG. 30.—Cara Cara eagles, and beach vegetation at San Jose del Cabo, Lower California. Photograph by Bartsch.



FIG. 31.—Tree Cacti, a characteristic scene at the head of Concepcion Bay, Lower California. Photograph by Bartsch.

also continued among the Indians of western Pennsylvania, southwestern New York, Montana, and the Rio Grande Valley in New Mexico. Some study was given to the problem of the Indian population, and the special researches in Indian music were continued among the Chippewa.

A certain amount of work in the way of excavation and repair was accomplished at Cliff Palace in southern Colorado, and a study was made of the extensive ruins in the Navajo National Monument, Arizona.

In 1911 field work was conducted by the bureau among the tribes which composed the Creek Confederacy of the southern states; the



FIG. 32.—Removing pottery and other objects from a cemetery within the older part of the ruins. The workmen are San Ildefonso Tewa Indians. Photograph by Hodge.

Tewa Indians of the Rio Grande Valley, New Mexico; the Winnebago Indians of Wisconsin and Nebraska; the Piegan, Blackfeet, Cheyenne, and Menominee Indians of the Algonquian family; the Chippewa Indians, especially with reference to their music; the Osage Indians, now in Oklahoma, and the Iroquois in New York.

In the fall of 1911, Mr. F. W. Hodge, Ethnologist-in-charge of the bureau, represented the Institution in an expedition to New Mexico, conducted under the joint auspices of the bureau and the School of American Archæology at Santa Fé. Early in September Mr. Hodge proceeded to El Morro, or Inscription Rock, in western New Mexico, where, with the assistance of Mr. Jesse L. Nusbaum of

the School of American Archæology, paper impressions and photographs of the inscriptions on the rock were made. El Morro is an enormous sandstone rock rising about 200 feet from the plain, and eroded in such fantastic forms as to give it the appearance of a great castle, hence its Spanish name, El Morro. A small spring formerly existing at the rock made it a convenient camping place for the Spanish explorers of the seventeenth and eighteenth centuries, and the smooth face of "the castle" well adapted it to receive the inscriptions of the conquerors of that early period. The earliest inscription, and historically the most important, is that of Juan de Oñate, colonizer of New Mexico and the founder of the city of Santa Fé in 1606. It

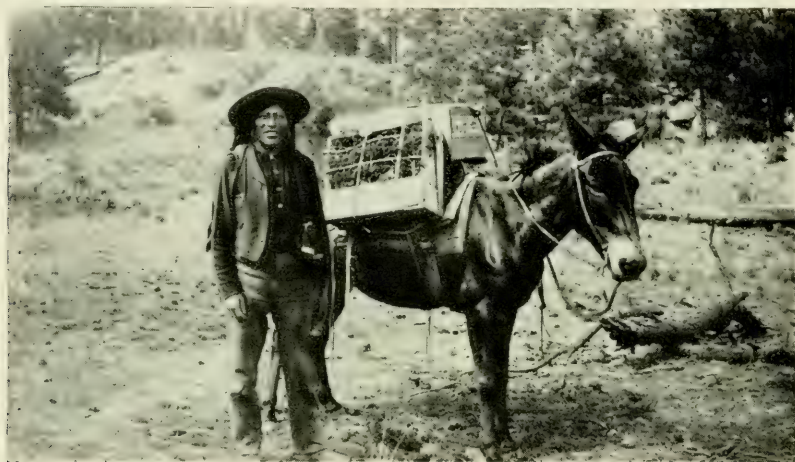


FIG. 33.—Indian taking down specimens from the top of the 1,800-foot mesa.
Photograph by Hodge.

was in this year that Oñate, on his return from a trip to the head of the Gulf of California, visited El Morro and carved this inscription: "Passed by here the officer Don Juan de Oñate from the discovery of the South Sea, April 16, year 1606."

There are nineteen other Spanish inscriptions of almost equal importance, among them that of Don Diego de Vargas, who in 1692 conquered the Pueblo Indians after their rebellion against Spanish authority in 1680. The paper impressions, or "squeezes," have been transferred to the National Museum, where plaster casts have been made of them for permanent preservation.

Although El Morro has been made a National Monument by proclamation of the President, there is no local custodian, and conse-

quently the rock is exposed to vandalism. The inscriptions, so important in relation to the early history of the southwest, are ever threatened with destruction at the hands of thoughtless visitors who scratch their own names in dangerous proximity to these old records of early exploration.

Mr. Hodge later joined Dr. Edgar L. Hewett, director of the School of American Archaeology, on an expedition to the Jemez valley, about 65 miles northwest of Albuquerque, where excavations were



FIG. 34.—El Morro, Inscription Rock in western New Mexico.

conducted in the ruins of a large stone pueblo known as Kwasteyukwa, which measures about 1,100 feet by 600 feet, and is situated on a mesa rising 1,800 feet above Jemez River. This pueblo was evidently contemporary with Amoxiumqua, which was occupied from prehistoric times to the year 1622, when it was abandoned on account of the depredations of the Navajo Indians. Seven years later Amoxiumqua was rebuilt and re-occupied at the instance of a Franciscan missionary and remained inhabited for some time prior to 1680 when it was permanently abandoned.

Excavations, chiefly in the refuse heaps which formed the cemeteries of Kwasteyukwa, brought to light about 125 skeletons and more

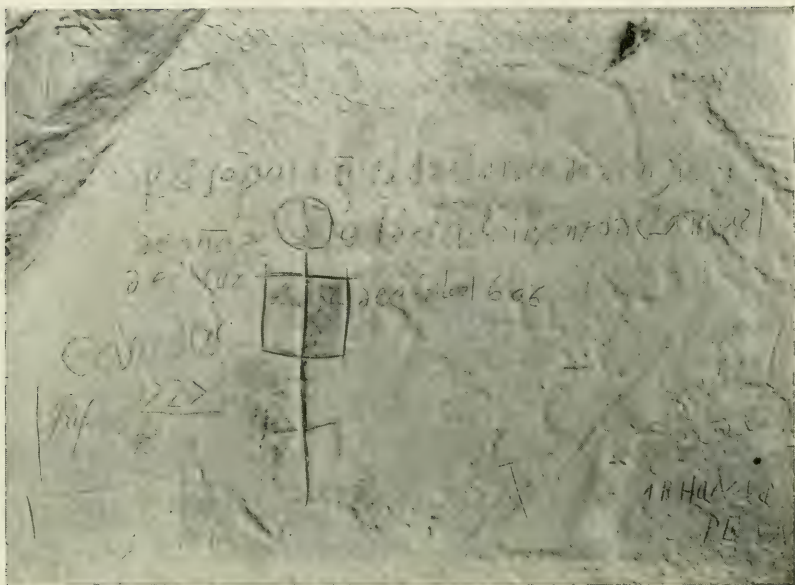


FIG. 35.—Inscription at El Morro: "Passed by here the (officer) Don Juan de Oñate from the discovery of the South Sea, April 16, year 1606." Photograph by Hodge.

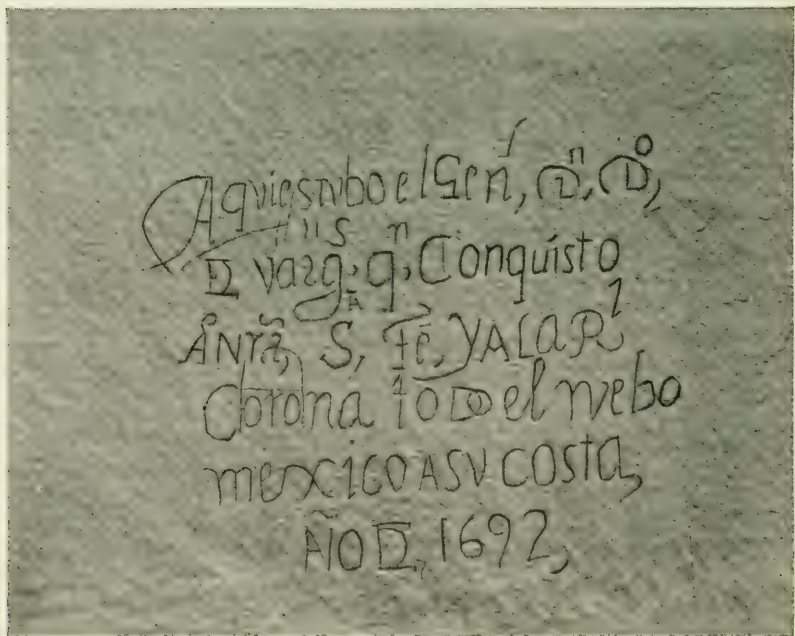


FIG. 36.—Inscription at El Morro: "Here was the General Don Diego de Vargas, who conquered for our holy faith, and for the Royal Crown, all of New Mexico, at his (own) expense. Year of 1692." Photograph by Hodge.

than 200 vessels of pottery, mainly in fragments because the occupants had the custom of "killing" the vessels deposited with the dead by



FIG. 37.—Debris of the walls of the great pueblo of Kwasteyukwa, New Mexico. Photograph by Hodge.



FIG. 38.—The excavation camp at Kwasteyukwa, New Mexico. Photograph by Hodge.

heaping large stones upon them. All the fragments were carefully preserved, however, and are now in the National Museum, where

they will be repaired and made available for exhibition and study. Most of the pottery bears decorations in color, and some of it shows close relationship to pottery found in ancient Hopi ruins of north-eastern Arizona. Studies by the Bureau of American Ethnology among the Indians of the latter region show that some of their clans came from the Jemez country, and the archeological studies in the Jemez valley likewise show early connection between the occupants of these two areas. In addition to the pottery, numerous objects of bone, stone, and shell were found. Among the most significant of the finds are the remains of a necklace, accompanying the skeleton of a child, consisting of 24 Venetian glass beads, substantiating the conclusion that Kwasteyukwa was contemporary with Amoxiumqua, which latter village, according to early Spanish records, was occupied within the historical period.

A VISIT TO THE PETRIFIED FOREST OF ARIZONA

In the spring of 1911, Dr. George P. Merrill, Head Curator of Geology in the National Museum, was detailed, at the request of the Secretary of the Interior, to visit the Petrified Forest of Arizona for the purpose of selecting certain areas of the reservation from which schools, colleges, and scientific institutions might collect specimens under permits from the Interior Department, in accordance with the Act of Congress for the Preservation of American Antiquities, approved June 8, 1906.

The Petrified Forest is a government reservation of eighty square miles, containing fossilized trees and wood of great scientific interest. The nearest town is Holbrook, while just on the outskirts of the forest is the hamlet of Adama. The fossilized trees and other remarkable features of the reservation have proved a great attraction to visitors, but heretofore no collecting has been permitted, for an indiscriminate removal of specimens would have wrought great injury to this remarkable work of nature. It is believed, however, that after a careful examination of the forest it will be possible to set aside certain areas from which duly authorized institutions may be permitted to make collections for scientific and educational purposes, without detriment to the forest as a whole.

BIRD STUDIES IN THE ALEUTIAN ISLANDS

Some two or three years ago, Mr. A. C. Bent, of Taunton, Massachusetts, undertook the task of completing the work on the life-histories of North American birds, which was originally projected by



FIG. 39.—Gulls on nests. Photograph by Bent.



FIG. 40.—Pallas's Murrelets on Bogoslof Island. Photograph by Bent, July 4, 1911.

the late Major Charles Bendire. Two volumes of this work, prepared by Major Bendire, have already been published by the National Museum and Smithsonian Institution. In order to obtain the necessary data to finish this comprehensive treatise, Mr. Bent intends to make a number of excursions to various out-of-the-way parts of North America where birds can be observed on their breeding-grounds.



FIG. 41.—Pallas's Murres on Bogoslof Island. Photograph by Bent, July 4, 1911.

In this connection a small party of naturalists made a brief visit to the Aleutian Islands and Bering Sea during the season of 1911, chiefly in the interests of the Smithsonian Institution and the Biological Survey of the Department of Agriculture, and especially to make a study of land and marine birds. Through the coöperation of the Treasury Department, the party was afforded transportation on the revenue cutter *Tahoma*. The party consisted of Messrs. A. C. Bent; Rollo H. Beck, of San José, California; Alexander Wetmore, of Lawrence, Kansas; and Fred B. McKechnie, of Boston, Mass.

Mr. Bent remarks in his report that the party sailed from Seattle, Washington, on May 19, and took the inside passage north to Ketchikan, where they remained a few days, and from there they sailed out through Dixon Entrance and nearly west across the Pacific Ocean to Unimak Pass. They entered the pass on June 4, anchored for one night at Akun Island, and reached Unalaska on June 5. After discharging the cargo and coaling, they started on the western trip among the Aleutian Islands on June 10, with orders for the *Tahoma* to return to Unalaska on July 1. This gave the party less than three



FIG. 42.—Red-faced Cormorants on Walrus Island. Photograph by Bent, July 7, 1911.

weeks in which to explore over 800 miles of difficult islands, an undertaking for which three months would have been hardly time enough. The expedition cruised the whole length of the chain, however, and landed on Atka, Kiska, Attu, Tanaga, and Adak islands, besides visiting the western end of Unalaska Island, landing at Chernofski.

The reconnaissance of the Aleutian chain was necessarily so superficial and hurried that merely a brief report of the results has yet been made, a full description of the topography and the flora and fauna being reserved until a more complete biological survey can be under-

taken by some subsequent expedition. However, in spite of the short time at their disposal, the four members of the party used the excellent facilities at their command to the best advantage, and by constant hard work accomplished very satisfactory results. The officers of the *Tahoma* gave the party very valuable assistance and did everything in their power to further the objects of the expedition, especially Chief Engineer John I. Bryan, Lieutenant John T. Carr, Lieutenant Herbert N. Perham, and Doctor Louis Schwartz.

Some good series of land birds were collected on nearly all of the



FIG. 43.—California Murres on Walrus Island. Photograph by Bent, July 7, 1911.

islands visited, including a particularly fine series of the various subspecies of ptarmigan, among which a new species was discovered. This new form inhabits Tanaga Island.

Various interesting facts were learned regarding the distribution and habits of the birds of this region, but so much important work in this line still remains to be done, that further and more thorough explorations would well be worth while.

On returning to Unalaska on July 1, the party was informed by the Commander of the Bering Sea fleet, that the Revenue Cutter Service could do no more for them, as the *Tahoma* was needed on the

seal-island patrol. Therefore other arrangements were made for transportation during the remainder of the season. Mr. Wetmore went to Unalaska to work in that vicinity for a while and to secure passage homeward along the south side of the Alaska Peninsula. The results of his work, however, belong to the Biological Survey. The remainder of the party secured passage to Nome on the gasolene schooner *Polar Bear*, owned and commanded by Mr. Louis L. Lane, of Seattle. They sailed from Unalaska on July 3, and reached Nome July 11, having spent one day on Bogoslof Volcano, half a day on St. Paul Island, half a day at Walrus and a day at St. Matthew and Hall islands.

No thorough work could be done on such a hurried trip, but a fairly good impression was obtained of the avifauna of these interesting islands and a large series of photographs taken.

Although the Murre colonies at Bogoslof Island were the most extensive seen and probably included the greatest number of birds, they were totally eclipsed in density by the wonderful colonies on Walrus Island. This is a most remarkable little island, an ornithological wonderland, where ten species of seabirds breed in countless multitudes. The California Murres rank first in number, literally covering the low cliffs and rocky shores all around the island, as well as large spaces on top of it, with dense masses of birds sitting close together.

STUDIES IN CAMBRIAN GEOLOGY AND PALEONTOLOGY IN THE CANADIAN ROCKIES

During the field season in 1909, Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, continued his investigations in the geology of the Cambrian and pre-Cambrian rocks of the Bow River Valley, Alberta, Canada, and on the west side of the Continental Divide north of the Canadian Pacific Railway in British Columbia.

The first camp was made on the shores of Lake Louise, southwest of Laggan. From this point work was carried forward on the high mountains east, northeast, and southwest of the lake, and side trips were made to the Valley of the Ten Peaks and across the Bow Valley in the vicinity of Ptarmigan Lake. Many fine photographs were secured, both of the beautiful scenery and of the geological sections which are wonderfully well shown above timber line on the higher ridges and peaks.

The measurements of the Cambrian section were carried down to a massive conglomerate which forms the base of the Cambrian

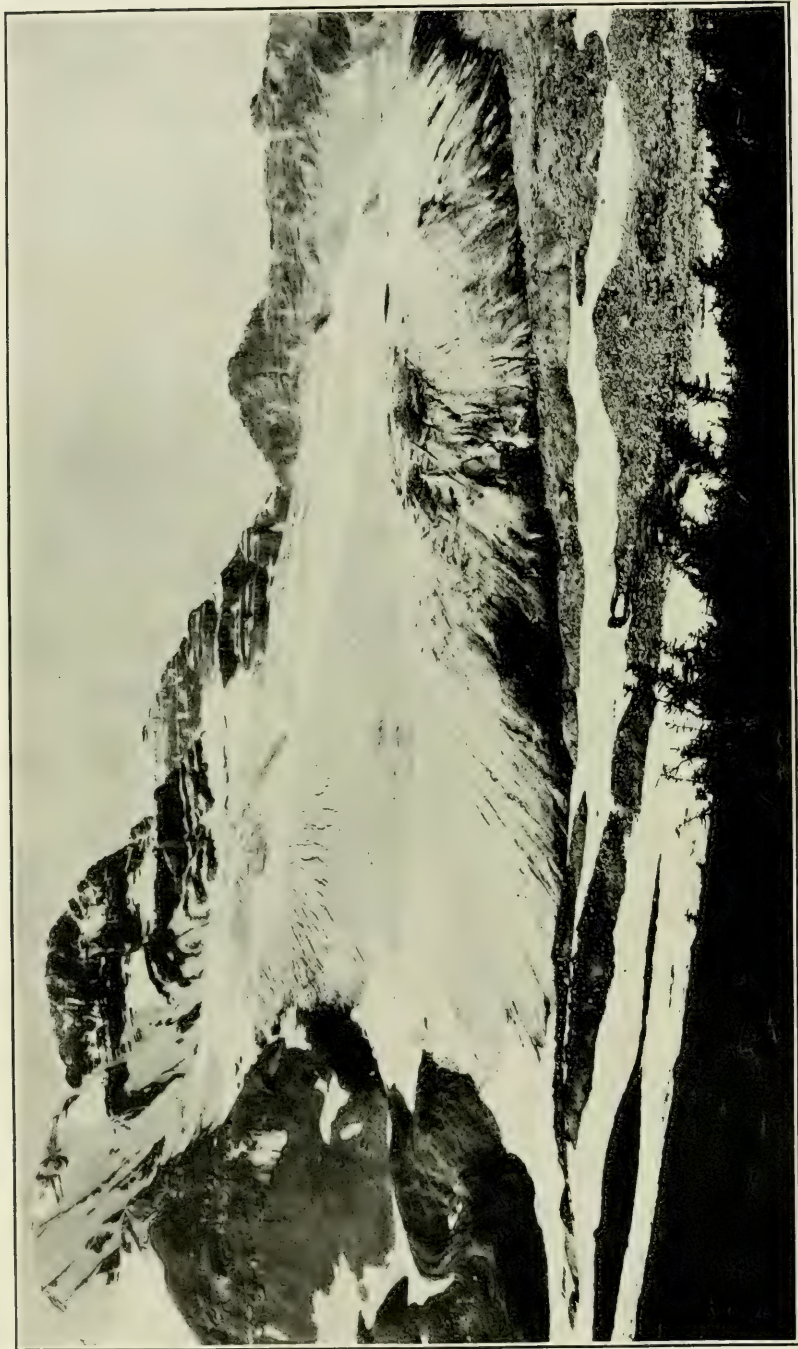


FIG. 44.—Vice-President Peak with Vice-President Glacier in the foreground, taken with 24-in. lens from a point on the soil-covered moraine on the north slope of a terrace at the foot of Vice-President Peak, 7 miles north-northeast, in an air line, from Field, British Columbia. Photograph by Walcott.

system in this portion of the Rocky Mountains. This discovery led to the study of the pre-Cambrian rocks of the Bow River Valley. These were found to form a series of sandstones and shales some 4000 feet in thickness, that appear to have been deposited in fresh-water lakes prior to the incursion of the marine waters in which the great bed of conglomerate and the Cambrian rocks above were deposited.

Completing the reconnaissance survey of the Bow River area,



FIG. 45.—Northern end of fossil quarry in Middle Cambrian Burgess shale about 700 feet above Burgess Pass trail on ridge between Mount Wapta and Mount Field, about 8 miles from Field, British Columbia. Photograph by Walcott.

camp was moved to the Yoho River Canyon. In this canyon, one of the most picturesque and instructive areas in the great Yoho National Park of Canada, a study was made of the north side of the President Range and numerous pictures were taken in that vicinity, as well as from Burgess Pass, north of Field.

A most interesting discovery of unique Cambrian fossils was made near Burgess Pass and a number of specimens collected before the snow drove the party back to Field. Three days were then spent on Mount Stephen, at the famous trilobite beds, before breaking up camp on September 8, 1909.

When opportunity offered during the fall and winter, field notes were written up and studies made of the sections obtained during the summer. As the results of these studies two papers were issued in the Smithsonian Miscellaneous Collections, Volume 53: No. 6, Publication 1934, "Olenellus and other Genera of the Mesonacidae," and No. 7, Publication 1939, "Pre-Cambrian Rocks of the Bow River Valley, Alberta, Canada." Preliminary studies were also made of the unique crustacean fauna found in the Middle Cambrian rocks of Burgess Pass.



FIG. 46.—Mountain showing folding of Upper Cambrian rocks on northwest side of Amiskwi Pass. Photograph by Walcott.

In the field season of 1910, the secretary continued the study of the Cambrian strata of the section of the Rocky Mountains adjacent to the main line of the Canadian Pacific Railway, special attention being given to the Stephen formation. The outcrop of this formation was carefully examined for many miles along the mountain sides, with the hope of finding a locality where conditions had been favorable for the preservation of the life of that epoch. The famous trilobite locality on the slope of Mount Stephen above Field had long been known and many species of fossils collected from it, but even there the conditions

had not been favorable for the presence and preservation of examples of much of the life which, from what was known of older faunas and the advanced stage of development of the Upper Cambrian fauna, must have existed in the Middle Cambrian seas. During the season of 1909, the finding of a block of fossiliferous siliceous shale which had been brought down by a snowslide on the slope between Mount Field and Mount Wapta, led the secretary to make a thorough examination of the section above it in 1910. Every layer of limestone and shale was examined, until the fossil-bearing band was finally located. After



FIG. 47.—View looking out of a glacial cirque in the Van Horne Range, British Columbia. These abandoned cirques are very common in the Canadian Rockies where they are frequently occupied by shallow lakes and snow banks, like those in the immediate foreground. Photograph by Burling.

that, for 30 days the shale was quarried, slid down the mountain side in blocks to a trail, whence it was transported to camp on pack horses, where the shale was split, trimmed, and packed and then taken down to the railway station at Field, 3,000 feet below.

A number of sections of the Cambrian rocks were studied and measured in the mountains north and south of Laggan, Alberta, and many beautiful panoramic photographs secured.

Most of the field season of 1911 was spent in a continuation of the work of 1910 upon the fossil bed between Mount Field and Wapta Peak. Camp was established and a trail built to the fossil quarry in the shale 800 feet above. The secretary, with his assistants, continued collecting as in 1910. This was a more or less tedious task, the monotony of which was relieved by the occasional discovery of a prize specimen, the exploding of a charge of dynamite, the passing of

a party of tourists on the trail seven hundred feet below, or by sudden showers and snow flurries. In September a start was made for the Amiskwi Pass region northwest of Field. Rain, followed by snow, met the party on the pass. On September 22, the snow was so deep that the wild animals had left the higher canyons and ridges, and the party reluctantly retreated to Field, to meet there a snow storm that closed all field work for the season of 1911.



FIG. 48.—Mr. Burling packing fossils at Glenogle, B. C.

Mr. L. D. Burling spent the summer of 1910 in the collection of fossils and in the study of the stratigraphy of a portion of the rocks in the Yellowstone National Park and in the Big Horn and Wind River Mountains of Wyoming. The sections measured were found to be essentially identical with each other and much similar to those of Colorado. The chief purpose of the work was the correlation and

proper interpretation of the lower Ordovician fossil fish horizons. A short visit was made to the type localities in the vicinity of Manitou and Cañon City, Colorado, and several hundred pounds of fossils were added to the collections. The latter part of August and the early part of September 1911 were spent in the study of the Lower Paleozoic rocks of the Van Horne Range and at places along the line of the Canadian Pacific Railway west of Field, principally at Glenogle.

Quite an interesting and extensive series of Ordovician and Silurian fossils were collected at the town of Stony Mountain, about 15 miles from Winnipeg, Manitoba.

The Canadian Pacific Railway near Glenogle was such "good going" that the fossils were carried in hundred-pound lots. The hunting coat as well as the knapsack (fig. 48) are filled with rocks which are crowded with the fossil remains of minute and ancient animals.

BIOLOGICAL SURVEY OF THE MOUNT ROBSON REGION IN THE CANADIAN ROCKIES

Through the courtesy of the Canadian Government and of Dr. A. O. Wheeler, president of the Alpine Club of Canada, the Smith-



FIG. 49.—Mount Robson, British Columbia. Photograph by Hollister, 1911.

sonian Institution was enabled, in the summer of 1911, to send a small party of naturalists to accompany Dr. Wheeler on his topographical survey of the British Columbia and Alberta boundary line and the Mount Robson region. The party started in June, and returned in October, 1911.

Mr. N. Hollister, of the United States National Museum, naturalist in charge of the party, reported on his return the expedition had been very successful in obtaining a fairly complete collection, covering practically all the birds and mammals inhabiting this previously unworked territory, together with many insects and botanical specimens. The party of naturalists consisted of four members,

including Mr. Hollister, and Mr. J. H. Riley of the Division of Birds in the National Museum. Assembling at Edmonton, Alberta, Canada, early in July, 1911, they proceeded on the Grand Trunk Railroad to the end of the line where they took pack horses and penetrated the Mount Robson region. The land surveyed included the territory lying about this mountain in the heart of the Canadian Rockies, comprising the most rugged and broken country imaginable. Amid this wonderful scenery Mount Robson rises in titanic outline, the highest peak in Canada, probably between 14,500 and 15,000 feet high, and surrounding it for a distance of 50 miles in all directions lies the field of the survey. In this wild and unclaimed country the party of naturalists remained nearly four months, protected by special permits from the Canadian government. The natural history work was divided up, Mr. Hollister and Mr. Riley collecting the birds and small mammals, while the other two collectors hunted big game. The collection includes some 900 specimens of birds and mammals, the latter being of all kinds from tiny shrews to caribou and bears. One enormous grizzly bear was obtained by a fortunate shot. Much fine material for exhibition groups was secured, including a series of caribou, mountain goats, mountain sheep, beavers, and many varieties of smaller animals. As already mentioned, large numbers of plants and insects were also collected. All this material was turned over to the National Museum.

INVESTIGATIONS OF MAINE SHELL-HEAPS

While the above explorations were being carried on in various regions, a number of minor investigations were undertaken along the Atlantic seaboard. One of these had for its purpose the assembling of animal remains from the shell-heaps of the Maine coast, eastward from Penobscot Bay, in order to ascertain whether the fauna at the time the heaps were accumulating was different from that now existing in the same region, a question which seemed to demand attention from the fact that an extinct species of mink had been found in some of the heaps. The work was carried on by Dr. F. W. True in the summer of 1910, in continuation of investigations of preceding years, the field of operations extending from Sargentville, opposite Deer Isle, to Harriman's Point in Bluehill Bay. Large numbers of bones and teeth of mammals and other vertebrates were obtained, as well as fragments of pottery and other objects of human workmanship. A part of this territory was explored some years ago by Major J. W. Powell and Mr. Frank H. Cushing of the Bureau



FIG. 50.—An Indian shell-heap on Herrick's Bay, Hancock County, Maine.
Photograph by True.



FIG. 51.—A bluff on Herrick's Bay, Hancock County, Maine, on which the shell-heap shown in Fig. 50 is located. Photograph by True.

of American Ethnology, and the collections which they made, as well as the later ones, are preserved in the National Museum. While remains of the extinct species of mink were abundant in the shell heaps referred to, and have also been obtained from heaps on the



FIG. 52.—Naskeag Point, Hancock County, Maine, looking from the Indian shell-heap on the shore. Photograph by True.

shores of Casco Bay, the fauna as a whole was found to correspond to that now existing in the region.

EXPERIMENTS ON MARINE WORMS AT WOODS HOLE, MASSACHUSETTS

During the summer of 1911, Dr. J. E. Benedict, Chief of Exhibits of the Department of Biology in the National Museum, made some interesting experiments at Woods Hole, Mass., in preparing specimens of marine worms and some other invertebrates in such a manner that they would aid in interpreting the fossil forms obtained by Dr. Walcott in the Cambrian strata of British Columbia. By submitting the specimens to pressure and afterwards casting them in plaster, some data were obtained which serve to explain peculiarities found in the fossils.

STUDIES OF THE FISHES OF THE DISTRICT OF COLUMBIA

For a year or more, Messrs. B. A. Bean and A. C. Weed of the Division of Fishes in the National Museum, have availed themselves



FIG. 53.—Pool near Chain Bridge, containing many Black Bass and other fish, connected with the Potomac only in very high water. Photograph by Weed.



FIG. 54.—Trammel's Pond, one-fourth mile from Potomac River and one-half mile from Difficult Run. This pond is nearly alive with elusive Black Bass. Photograph by Weed.

of such opportunities as occurred to collect specimens of the fishes of the District of Columbia for a special faunal exhibit in the Museum,



FIG. 55.—Lower end of Little Falls, D. C. Snagging for herring. Photograph by Weed.



FIG. 56.—Seine haul at Ferry Landing fishing shore, Va. Shad and herring. Photograph by Weed.

and also to add to the knowledge of the distribution and habits of the various species. The fauna of each of the several classes of

waters, river, lowland streams, creeks, upland brooks, and pools, was investigated, and much new information was obtained regarding the forms living in the different environments, while the list of species was considerably augmented, the whole number known being ninety-three.

COLLECTING BIRDS IN SOUTH CAROLINA

On April 15, 1911, three members of the Museum staff from the Division of Birds, Dr. Edgar A. Mearns, Mr. J. H. Riley, and Mr. E. J. Brown, made a trip at their own expense, to South Carolina for the purpose of collecting birds for the National Museum, from the neighborhood of Christ's Church Parish, in Charleston County. This county abounds in birds and is of much interest to ornithologists from the fact that it was here that Audubon and Bachman made collections in 1831 and 1832. Messrs. Brown, Mearns, and Riley obtained some 600 specimens, including some 50 prototypes out of 72 which are described from this locality. Among them were many water-birds not previously in the Museum collections, and also warblers, plovers, curlews, Mississippi Hites, etc. Some reptiles (including a coral snake), were also collected by the party which was in the field about five weeks. Dr. Mearns remained in the field a week longer, and collected many plants for the Museum.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 60, NUMBER 30

(End of Volume)

EXPLORATIONS AND FIELD-WORK OF THE
SMITHSONIAN INSTITUTION
IN 1912



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EXPLORATIONS AND FIELD-WORK OF THE SMITHSONIAN INSTITUTION IN 1912

In 1912, as in preceding years, The Smithsonian Institution carried on field-work in various parts of the world by means of small allotments from its funds, and by coöperating with institutions and individuals engaged in similar activities. Several friends of the Institution contributed funds for special work, or provided opportunities for participation in explorations which they had undertaken personally or through the aid of others.

All these operations resulted in extending the boundaries of knowledge, and in several cases added important material to the collections of the National Museum. The Institution is obliged every year to forego opportunities for important work in many fields. With larger means it could engage in more extensive field operations which could confidently be expected to yield rich returns both in increase of knowledge and in additions to the national collections.

Most of the information contained in this account has been furnished by those who participated in the various expeditions.

About twenty different parties were in the field during 1912, and the regions visited comprised British East Africa, Abyssinia, Algeria, eastern Siberia and Mongolia, the Altai Mountain district, Borneo, St. Lawrence Island, Alaska, British Columbia, Alberta, Newfoundland, Labrador, the Panama Canal Zone, the Bahama Islands, the West Indies, and many parts of the United States.

Some of the work done in 1912 was in continuation of operations initiated in previous years, and described in the article on explorations published by the Smithsonian some months ago.¹ As regards the Government branches of the Institution, it should be said that the Bureau of American Ethnology engages largely in field-work as a

¹ Expeditions Organized or Participated in by the Smithsonian Institution in 1910 and 1911, Smithsonian Misc. Coll., Vol. 59, No. 11, 1912.

part of its regular activities. The National Museum has no special funds for exploration, and on that account can embrace only a few of the opportunities which are presented for enlarging its collections



FIG. 1.—A native of Borneo. Photograph by Streeter.

through field-work. The Astrophysical Observatory occasionally obtains funds from Congress for observations outside the United States. The functions of the other branches—the National Zoölogical Park, the International Exchanges, the Regional Bureau of the

International Catalogue of Scientific Literature—are not of such a character as to involve work of the kind now under consideration.

A ZOÖLOGICAL AND ETHNOLOGICAL EXPEDITION TO DUTCH
EAST BORNEO, MAINTAINED BY DR. W. L. ABBOTT

As a result of the zoölogical and ethnological explorations carried on for many years by Dr. W. L. Abbott in the East Indies, the National Museum, through his generosity, contains the largest and most important collections from that part of the world to be found in any museum. Having discontinued the work himself, he was, nevertheless, desirous that collections should be made in Dutch East Borneo, a region which he had not visited, and with much liberality he provided the means for sending Mr. H. C. Raven into that territory to procure characteristic mammals as well as any ethnological material that might prove of interest. A letter from Mr. Raven, who left the United States about March 1, 1912, and is still in the field, announces that he has had a successful trip and has made a large collection.

MR. D. D. STREETER'S EXPEDITION TO BORNEO

Mr. Daniel Denison Streeter, Jr., of Brooklyn, N. Y., offered his services as a volunteer collaborator for the National Museum. He sailed from New York about April 15, 1912, and returned to the United States in December. He passed from Sarawak into Dutch Borneo by ascending the Rejang River and crossing the mountains on the dividing line to the Kajan River. He then ascended to the head of this river, and crossed another range to the head-waters of the Mahakam River which he descended to the Strait of Macassar. A small but interesting collection of mammals was secured, including two skulls of the Rhinoceros.



FIG. 2.—Kuching, Sarawak, Borneo. Photograph by Streeter.



FIG. 3.—Kuching, Sarawak, Borneo. Photograph by Streeter.



FIG. 4.—View in Sarawak, Borneo. Photograph by Streeter.



FIG. 5.—View of the interior of town of Kuching, Sarawak, Borneo. Photograph by Streeter.

MR. GEORGE MIXTER'S COLLECTING TRIP TO LAKE BAIKAL

Another collaborator of the National Museum, Mr. George Mixter, of Boston, Massachusetts, an experienced big-game hunter, volunteered to collect large mammals for the Museum in the vicinity of Lake Baikal, Siberia, during the summer of 1912. The main object of Mr. Mixter's trip was to secure specimens of the native bear and of the seal peculiar to Lake Baikal, neither of which was represented in the collections of the National Museum. He succeeded

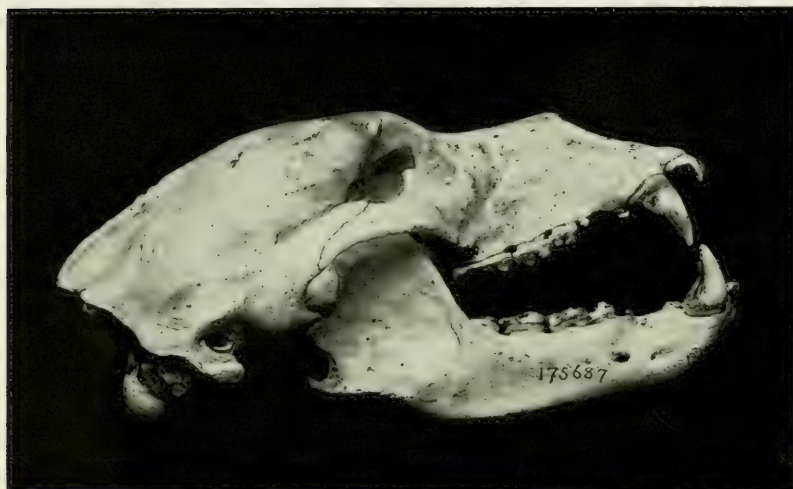


FIG. 6.—Skull of a Siberian bear, from near Lake Baikal, collected by Mr. Mixter. Photograph by National Museum.

in obtaining good specimens of both. The bear skull shown in figure 6 is from his collection.

DR. W. L. ABBOTT'S OPERATIONS IN CASHMERE

Dr. W. L. Abbott, to whom reference has already been made, returned to Cashmere early in the spring of 1912, when he interested himself in trapping and studying the habits of the smaller mammals of that country. He sent to the National Museum many valuable specimens and much interesting information.

THE ZOÖLOGICAL EXPEDITION OF DR. THEODORE LYMAN TO
THE ALTAI MOUNTAINS, SIBERIA AND MONGOLIA

By the invitation of Dr. Theodore Lyman, of Harvard University, the National Museum was enabled to participate, in coöperation with the Museum of Comparative Zoölogy, in a zoölogical expedition to the Altai Mountains of Siberia and Mongolia. As this region was unrepresented by specimens in the National Museum, the opportunity afforded was an exceptionally important one. The expedition was under the personal direction of Doctor Lyman who

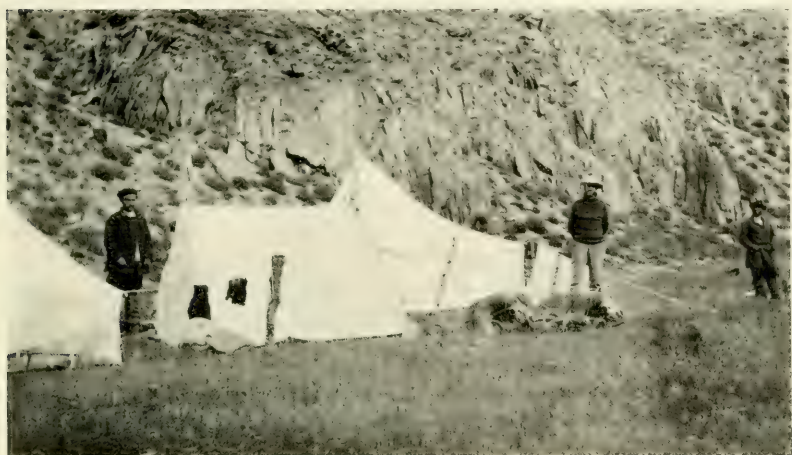


FIG. 7.—Collecting camp in the Altai Mountains near the Mongolian border.
Photograph by Hollister.

devoted his time chiefly to the collecting of large game. The National Museum was represented by Mr. N. Hollister, assistant curator of mammals, who had as his assistant in the work of collecting the smaller vertebrates, Conrad Kain, of Vienna, Austria.

The party left America in May, 1912, and returned in September of the same year. It entered Asia by way of the Trans-Siberian Railroad. The railway was left at Novonikolævsk, on the Obi River, and the long journey southward to the last Russian post near the Mongolian border was made by river boat and tarantass in 17 days. At this outpost, Kosh-Agatch, Kalmuk and Tartar guides and packers were secured, and the frontier range to the southward was then explored for a month. The collecting was done

chiefly on the Siberian side of the range, but expeditions were made to the Mongolian slopes for great game, and down to the Suok



FIG. 8.—Kirghiz marmot-hunter; the white tail in his right hand is waved to hold the marmot's attention until the gun is in position for the shot. Photograph by Hollister.



FIG. 9.—The collecting party breaking camp on the Tchegan-Burgazi River. Photograph by Hollister.

Plains, in the country of the Kirghiz. All this region is absolutely without trees or shrubs and, owing to its great altitude, is cold and stormy. A singular meteorological phenomenon in these mountains

is the frequent occurrence of electrical hail storms. The severity of these storms and the display of electricity accompanying them is terrific. During the entire trip the party enjoyed only three days without rain or snow. The average altitude of camps here was from 8,500 to 9,000 feet, and above this plane the mountains rise to snow and glacier covered peaks of 12,000 feet or more. The country is wild, barren, and desolate; and the only inhabitants, the nomadic Kirghiz and Kalmuks, are engaged in following their herds of yaks, horses, and goats.



FIG. 10.—Skull of a wild sheep, collected on the Altai expedition by Doctor Lyman. Photograph by the National Museum.

On the return trip, stops were made on the Chuisaya Steppe and in the heavily forested Altaïs between the desert and the great Siberian plains. Three different physiographical regions are represented in the collections, which include an almost complete series of the mammals and birds of this little-known part of central Asia. Chief among the specimens of great game are four fine rams of *Ovis ammon*, the largest of all wild sheep. There are also specimens of two species of ibex and a gazelle. Thirteen forms of mammals collected are new to science, and some twenty others taken were not before represented in the collections of the National Museum. In all, about 650 mammals and birds were secured, and will be divided between the two institutions concerned.

A SEARCH IN EASTERN ASIA FOR THE RACE THAT PEOPLED AMERICA

During the summer of 1912, Dr. Aleš Hrdlička visited, partly under the auspices of the Smithsonian Institution and partly in the interest of the Panama-California Exposition of San Diego, certain portions of Siberia and Mongolia in search for possible remains of the race that peopled America, whose home, according to all indications, was in eastern Asia.



FIG. 11.—A family of Yenisei Ostiaks. Photograph from the Ethnographical and Anthropological Museum of Peter the Great, St. Petersburg.

The journey extended to certain regions in southern Siberia, both west and east of Lake Baikal, and to Mongolia as far as Urga. It furnished an opportunity for a rapid survey, from the anthropological standpoint, of the field, and was made in connection with a prolonged research into the problems of the origin of the American aborigines carried on by Dr. Hrdlička on both parts of the American continent.

The studies of American anthropologists and archeologists have for a long time been contributing to the opinion that the American

native did not originate in America, but is the result, speaking geologically, of a fairly recent immigration into this country; that he is physically and otherwise most closely related to the yellow-brown peoples of eastern Asia and Polynesia; and that in all probability he represents, in the main at least, a gradual overflow in the past from north-eastern Siberia.

If these views be correct, then it seems that there ought to exist to



FIG. 12.—A Giliak woman from Sachalin.
Photograph donated by Prof. J. Talko-Hryniewicz.

this day, in some parts of eastern Asia, archeological remains and possibly even actual survivals, of the physical stock from which the American aborigines resulted, and every later publication that dealt with archeological exploration in eastern Asia, or brought photographs of the natives, has in one way or another strengthened these expectations.

A visit was made to certain parts of southeastern Siberia and to northern Mongolia. It included Urga, the capital of outer Mongolia, which encloses two great monasteries, and is constantly visited by

a large number of the natives from all parts of the country. Besides the field observations an examination was also made of the anthropological collections in the various Siberian museums within the area covered. The results were unexpectedly rich.

Dr. Hrdlička saw or was told of thousands upon thousands of burial mounds or "kourgans," dating from the present time back to the period when nothing but stone implements were used by man in



FIG. 13.—Oroczi, on the stream Koni, Eastern Siberia. Photograph donated by Prof. J. Talko-Hryncewicz.

those regions. And he saw and learned of numerous large caverns, particularly in the mountains bordering the Yenisei River, which yield human remains and offer excellent opportunities for investigation.

In regard to the living people, there were opportunities of seeing numerous Buriats, representatives of a number of tribes on the Yenisei and Abacan Rivers, many thousands of Mongolians, a number of Tibetans, and many Chinese, with a few Manchurians. On one occasion alone, that of an important religious ceremony, 7,000 natives could be seen assembled from all parts of Mongolia.

Among all these people there are visible many and unmistakable traces of admixture or persistence of what appears to have been the older population of these regions, pre-Mongolian and especially pre-Chinese, and those best representing these vestiges resemble to the point of identity the American Indian. These men, women, and children are brown in color, have black straight hair, dark brown eyes, and facial as well as bodily features which remind one most forcibly of the native Americans. Many of them, especially the women and children, if introduced among the Indians, and dressed to correspond, could by no means at the disposal of the anthropologist be distinguished apart. The similarities extend to the mental make-up of the people, and even to numerous habits and customs which new contacts and religions have not as yet been able to efface.

As a result of what he saw, Dr. Hrdlička expresses the belief that there exist to-day over large parts of eastern Siberia, and in Mongolia, Tibet, and other regions in that part of the world, numerous remains of an ancient population (related in origin perhaps with the latest paleolithic European), which was physically identical with and in all probability gave rise to the American Indian.

RESULTS OF MR. PAUL J. RAINEY'S EAST AFRICAN HUNTING EXPEDITION

Mr. Rainey's hunting trip was mentioned in the account of the Smithsonian expeditions of 1911.¹ He returned to America in December of that year, but Mr. Edmund Heller, who accompanied him as Smithsonian naturalist and collector, remained some time longer in British East Africa. The itinerary given last year was somewhat incorrect, as the original plan was changed after the party was organized.

The expedition arrived at Mombasa on March 22, 1911, and immediately proceeded by train over the Uganda Railway to Nairobi. The preparations for hunting and collecting were made there, and as soon as the safari was organized the expedition began active field operations. Proceeding southwestward from Nairobi, the safari passed over a high, rolling plateau to the Loita Plains, or Sotik District. Game was found here in great abundance. Many lions were living in the district, having been attracted by the great herds of antelopes and zebras. Six months were spent in hunting lions with dogs, and in making collections of the large and small mammals.

¹ Op. cit., p. 2.

Twenty-eight lions were secured during this time, and the expedition returned to Nairobi over the same route by which it had entered the district. After a short delay at Nairobi, the safari proceeded northward to the desert region on the Abyssinian frontier. Only the northern edge of this desert could be explored owing to the lack of camels for transportation, as all these animals had been recently acquired by the government for military purposes. The route from Nairobi lay directly northward to Fort Hall, thence along the west slope of Mount Kenia to Nyeri. From this station the party traveled along the north slope of the great mountain for a few days and then struck directly northward into the low, dry, thorn brush desert. This desert extends several hundred miles northward to the Abyssinian Highlands, but only the southern part of it was visited. It is a very dry, hot region, of limited water supply, and long journeys are often necessary between waterholes or springs. Hunting operations were confined chiefly to the immediate vicinity of some of these waterholes since a fairly large per cent of the game animals inhabiting the district require water and visit the springs daily for their supply. The fauna here is identical with that of Somaliland in character, and very different from that of the East African highlands. Specimens of nearly all the species of mammals of this country were secured, including a cow elephant with record tusks. ²

Mr. Heller explored faunally two of the high mountains in the desert region. The highest of these was Mount Garguez which has an altitude of 8,000 feet, and is isolated by many miles of desert from its nearest neighbors. Its summit is covered by a dense forest similar to that found on Mt. Kenia. Previous to this trip the mountain had never been visited by a naturalist, and several new races of mammals were secured in the forest on its summit. Mr. Heller also visited another isolated mountain, Tololakin, a mountain somewhat lower and not so thickly forested, which showed a less specialized mammal fauna. After completing the survey of these two mountains, he proceeded to the Guaso Nyiro River and followed its course westward to the station of Nyeri, whence his route lay over the high plateau of the Aberdare Range and then down to Naivasha Station.

Mr. Rainey, in the meantime, had trained a second pack of hounds and in two months bagged over forty lions, sixteen of which were obtained in one day.

Mr. Heller then proceeded down the Uganda Railroad to Voi, which is the chief station in the Taita District, where he spent two weeks exploring the Taita Hills. Many rare mammals were secured

in the forests on the summits of these high ranges. After leaving the Taita Mountains he continued down the Uganda Railroad to the station of Maji-ya-chumvi in the Tarn Desert, a region very little known owing to its dryness and lack of game animals. Many small mammals were secured, most of which were new to the national collection. Another month was spent in the moist coast belt, which has quite a distinct fauna from the Tarn Desert or the highlands.

At the beginning of 1912 collections were made in the Kakumega Forest which lies on the northeast side of the Victoria Nyanza. It represents the easternmost extension of the Congo Forest, which pushes its way across Uganda and along the northern shore of the Victoria Nyanza to the Kakumega district. A great many Congo mammals were secured here, the most remarkable forms being the sloth-like tailless lemur, the Congo forest duiker, the Congo Colobus monkey, and several rare forest monkeys. Mammals and reptiles were found very abundant in the forest, and great numbers of specimens were preserved.

The zoölogical work done by the expedition added about a dozen genera and many species to the National Museum, and supplemented the work done by the Smithsonian African Expedition to an important degree. The described new species number about forty. Many new facts concerning the distribution of animals were secured by the exploration of new fields which was made possible by Mr. Rainey's liberality. In all, some 4,000 specimens of mammals were secured. Of these about 400 are large or may be counted as "big game." Birds were collected only in the unexplored territory, but the collection consists of some 400 specimens. The reptiles number more than 1,000, and the landshells are about equally numerous. Some 200 specimens of plants were also collected as accessory material in the study of the distribution of the fauna. The gathering of so large a collection was made possible through the large corps of native assistants which was furnished Mr. Heller by Mr. Rainey.

THE SMITHSONIAN EXPEDITION TO ALGERIA FOR THE STUDY OF THE HEAT OF THE SUN

Mr. C. G. Abbot, director of the Smithsonian Astrophysical Observatory, was engaged for five months in an astronomical expedition to Bassour, Algeria, with the object of confirming or disproving the supposed variability of the sun. The Astrophysical Observatory has been for seven years making observations on Mt. Wilson, in

California, on the daily quantity of solar heat. The observations are arranged in such a manner as to indicate not only the quantity of solar heat reaching the earth, but also the quantity of heat which would reach a body with no atmosphere, like the moon.

So far the observations have indicated that the sun is probably a variable star having a range of variation amounting to from five to ten per cent within an irregular interval of from five to ten days.



FIG. 14.—Mr. Ångström and the solar-constant apparatus at Bassour.
Photograph by Abbot.

In 1911 Mr. Abbot, assisted by Prof. F. P. Brackett, observed in Algeria, while his colleague, Mr. Aldrich, observed on Mt. Wilson, in California. The object of thus duplicating the measurements was to avoid any errors due to local atmospheric conditions which might have affected Mt. Wilson observations. As nearly one-third of the circumference of the earth lies between Mt. Wilson and Bassour, it could not be expected that a similar local disturbance could affect both stations at the same time and in the same manner. The observations of 1911 strongly supported the belief that the sun is variable, but owing to cloudiness their number was not sufficient to fully

establish this point. Hence, it was thought best to return to Algeria in 1912 for further data.

In this expedition Mr. Abbot was assisted in Algeria by Mr. Anders Knutson Ångström, of Upsala, Sweden.

The observations made by the Smithsonian party in Algeria in 1912 were on the whole very satisfactory. They occupied 64 days, and on more than 50 of these days Mr. F. E. Fowle made similar



FIG. 15.—River scene at M'Sila, Algeria, an oasis of the Sahara.
Photograph by Abbot.

observations on Mt. Wilson, in California. Much volcanic dust from the eruption of Mt. Katmai in Alaska, June 6 and 7, 1912, was diffused in the upper atmosphere, and greatly reduced the intensity of solar radiation observed at both stations. Many otherwise excellent days were spoiled by it. However, it did not prove fatal to the success of the expedition.

The results of the work of 1911 and 1912 thoroughly establish the supposed variability of the sun.

ANTHROPOLOGICAL RESEARCHES ON ST. LAWRENCE ISLAND,
ALASKA

In the month of April, 1912, Dr. Riley D. Moore proceeded to St. Lawrence Island on behalf of the Panama-California Exposition



FIG. 16.—A portrait of "Korringoktikuk" (something gathered together) and child, showing the usual method of carrying children. Photograph by Moore.

of San Diego and the National Museum, the necessary funds being furnished by the former. The expedition work was planned by Dr. Aleš Hrdlička, curator of the Division of Physical Anthropology of



FIG. 17.—Summer home of Oghoolki. Walrus meat drying on the storage-rack to the left. The bead in Oghoolki's hair is a sign of mourning. Photograph by Moore.

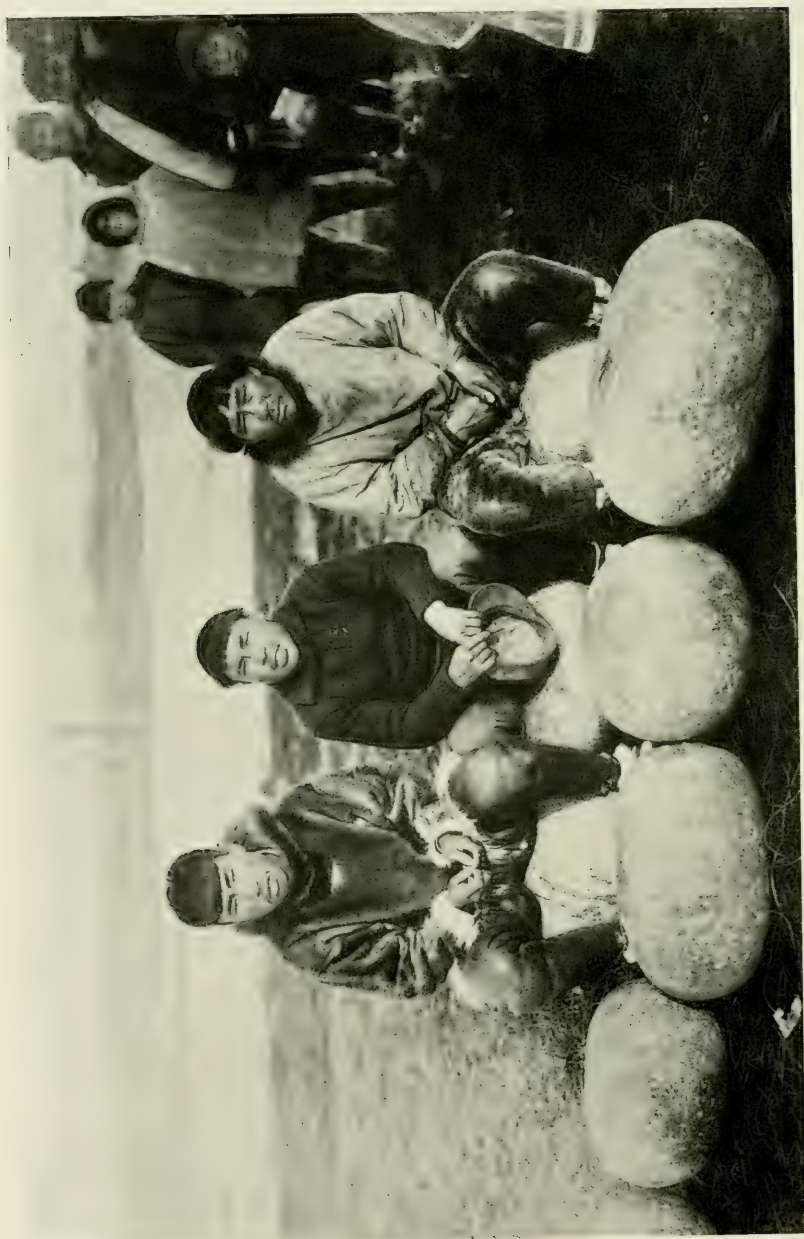


FIG. 18.—Three "strong men" of St. Lawrence Island, and the rocks they practice lifting. Photograph by Moore.

the National Museum, and the success of the undertaking was materially increased through courtesies extended by the Treasury Department and the Bureau of Education. Dr. Edward O. Campbell, a former teacher on St. Lawrence Island, also gave valuable advice regarding necessary supplies and equipment.

The journey from San Francisco to the island was made on the U. S. Revenue Cutter *Bear*. Iliuliuk, on the island of Unalaska, was the first stop, where the cutter remained for several days to clean boilers, thus permitting some measurements and observations of the natives. Later, visits were made to the Eskimo villages at Nome and St. Michael, and the graveyard near a deserted village on Golovin Bay was examined.

While lying at anchor in the Nome roadstead, word was received that two ships were caught in the ice off the Yukon Flats, and it was necessary to go at once to their relief. They were, however, out of the ice before the arrival of the *Bear*. While cruising about to learn the condition and extent of the ice, a radiogram brought the information that Kodiak was buried under four feet of volcanic ash and that the wireless telegraph station at Wood Island had been destroyed, and presently orders were received to proceed at once to Kodiak.

At a distance of two hundred miles from the scenes of disaster the *Bear* began to pass through large fields of volcanic ash, many acres in extent, which covered the ocean like a thick greyish-yellow cream. At Karluk, on the northwest coast of Kodiak Island, the deposit of ash was approximately a half inch in depth, but at the village of Kodiak, on the east shore of the island, there was a layer twelve to eighteen inches deep of very fine volcanic dust.

After remaining at Kodiak about three days the party returned to the Island of Unalaska where a stay of nearly a week made further researches possible. The vessel then proceeded to St. Lawrence Island, which was reached July 1, sixty-five days after taking ship at San Francisco.

This island is situated in the northern part of Bering Sea about forty miles from the Siberian coast which was plainly visible on the few clear days during the summer. The average summer temperature is about 40° Fahrenheit, and on the warmest day the past summer was 54°.

Work was started on July 6, and proceeded smoothly, though not always as rapidly as was desired, for nothing could induce these easy going Eskimos to hurry or to keep an appointment.

During the four months sojourn on St. Lawrence, considerable data of anthropometrical, physiological, and ethnological interest were obtained, besides plaster masks and photographs of men and women. Detailed accounts of religious, funeral, and other ceremonies, and a large collection of folk tales were also procured.

HUNTING AND TRAPPING ON THE ALASKAN-CANADIAN BOUNDARY

Mr. Copley Amory, Jr., of Cambridge, Massachusetts, a collaborator of the National Museum, accompanied the Coast Survey



FIG. 19.—Joe Creek, tributary of the Firth River. Photograph by Amory.

party which was engaged in surveying the Alaskan-Canadian boundary in the summer of 1912. He reached New Rampart House on July 11, and with a trapper and three dogs, packed over the mountains for 60 miles to the base of supplies on the Old Crow. He then went north to Joe Creek, a tributary of the Firth. After two weeks he returned to Old Crow and was joined by Mr. Thomas Riggs, Jr., with whom he travelled some 40 miles to the southwest in the caribou country, returning to the station on the Old Crow on August 23. There a canvas boat was built and a trip was made down to the mouth of the river, a distance of about 300 miles.

Mr. Amory obtained about 60 mammal skins, including a series of caribou, and also 30 bones of fossil mammals, among which was a camel-like ungulate.¹ He made observations on the distribution of



FIG. 20.—Leaving Rampart House, July 11, 1912. Photograph by Amory.



FIG. 21.—Crossing the headwaters of the Firth River a few miles from the Arctic divide on the Alaska-Yukon boundary. Photograph by Amory.

various species, including caribou, beaver and other rodents, foxes, wolves, weasels, etc.

¹This specimen, which proved to be a Pleistocene camel, is described by Mr. James W. Gidley in *Smithsonian Misc. Coll.*, Vol. 60, No. 26, 1913.

GEOLOGICAL EXPLORATION IN THE CANADIAN ROCKIES

In continuance of his investigation of the Cambrian geology in the main range of the Rocky Mountains of Alberta and British Columbia, Canada, Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, visited the region of the Yellowhead Pass, through which two great transcontinental railway lines, the Grand Trunk Pacific, and the Canadian Northern, are now building toward the Pacific coast.



FIG. 22.—Kodak view of Phillips Mountain with the névé and ice of Chushina Glacier, which extends down the slopes a mile where it overhangs the drainage line from Snowbird Pass. Photograph by Walcott, 1912.

After outfitting at Fitzhugh, east of the Yellowhead Pass, on the line of the Grand Trunk Pacific, the party crossed over the Pass on the Continental Divide and turned north from the line of the railway at Moose River, 17 miles west of the Pass. The Moose River was followed up to its head in Moose Pass, and a camp made at the head of Calumet Creek, which is a tributary of the Smoky River. The farthest camp out was made at Robson Pass, between Berg and Adolphus Lakes. Side trips were made from two camps in Moose

River valley, the Moose Pass camp and the Robson Pass camp. Many fine photographs were secured, and a reconnoissance section made of the great block of Cambrian and Ordovician strata from which the mountains of this region have been formed by uplift and erosion.

The most beautiful scenery was met with in the vicinity of Robson Peak. From a point 1,800 feet above the Robson Pass camp, one of the most interesting and superb views is obtained (fig. 27). The



FIG. 23.—Kodak view of a storm gathering over the Robson massif. In the foreground Smoky River flowing out of Lake Adolphus. Above the latter Robson Pass and then Berg Lake. The three glaciers Hunga, Blue, and Chupo, are seen in profile on the left. Photograph by Walcott, 1912.

horses in the photograph are near the edge of a cliff overlooking and rising 1,700 feet above the lake. Robson Peak rises cliff on cliff from the lake 7,000 feet (2,136 meters) to the summit, where the vapors from the Pacific gather nearly every day of the year. On the western side the slope is 8,800 feet (2,679 meters) from the summit to the floor of the valley above Lake Kinney. On the east and southeast the upper 3,000 feet are very precipitous, but below the slope is more gentle, forming the névé of the great Hunga (chief) Glacier. One of the

remarkable features of Robson Peak on the north is Blue Glacier. It is two miles in horizontal distance, and 7,000 feet in vertical fall between the snow cornices of Robson Peak and the foot of the glacier where the ice breaks off to float away as small bergs. Blue Glacier is a wonderful stream of falling, shearing, blue, green, and white ice. As seen in figure 24 the details of its marvelous descent are finely shown.

Iyatunga Mountain and Titkana Peak form the gateway to the great Hunga Glacier which is literally a river of ice. In figure



FIG. 24.—Kodak view of Blue Glacier, with Robson Peak concealed by mist. Photograph by Walcott, 1912.

27 three miles of its lower length is shown; the upper part is exhibited by figure 28, where the gathering fields of snow are seen on the slopes of Robson Peak and Mount Resplendent, and below the flow of the glacier over the cliffs where it merges into the broad river-like extension below.

The geological section was measured from Moose Pass (figure 30) southwestward over Tah Peak, Mount Mahto, Titkana Peak, and across by Phillips Mountain and the ridges of Lynx Mountain to Robson Peak.

North foot of
Mummi Peak

Mural Glacier

Mt. Gendarme
(9,607 feet)



Glacier covered with rock debris.

Mt. Gendarme
(9,607 feet)

Shota
Mountains

Chapa
Point



FIGS. 25 and 26.—Panoramic view of Mural Glacier. In lower cliff to left above camp-fire, a new locality of Lower Cambrian fossils was found. Entire glacier in foreground covered with loose rocks and debris from cliffs. Photographs by Walcott, 1912.

Titkana Mt.
(9,320 feet)

Phillips Mt.
(9,542 feet)

Hunga
Glacier

Iyatunga Mt.
(9,000 feet)

Blue Robson Peak Chupo
Glacier (13,068 feet. Glacier

Miniohan
Range

Robson Pass (5,500 feet)

Berg Lake (5,500 feet)

FIG. 27.—Panoramic view of the Robson massif, from a point on the ridge south of Mumm Peak.

Mt. Resplendent
(11,173 feet)

Billings
Butte

Hunga
Glacier

Robson Peak
(13,068 feet)

Iyatunga Mt.
(9,000 feet)

FIG. 28.—Panoramic view of the Robson massif and adjoining mountains; great Hunga Glacier in foreground. Taken from point nearly 2,000 feet above glacier on slope of Titkana Peak, shown in Fig. 27. Photographs by Walcott, 1912.

Glacier

Butte

(11,173 feet)

(10,471 feet)

Glacier (9,542 feet)

Glacier

Paha Point

Tokana Mountains

Moose River Valley

Tah Peak

FIG. 29.—Panoramic view in continuation eastward of Fig. 28, showing almost the entire section of the Upper Cambrian rocks.

Paha Point

Tokana Mountains

Moose River Valley

Tah Peak

Moose Pass

FIG. 30.—Panoramic view of Moose Pass. The strata of mountains on the right of the Pass are of Lower Cambrian age, and those on the left of Upper Cambrian age. A fault line with a throw of about 9,000 feet has thrust the Lower Cambrian over the Upper Cambrian on the line of the Pass. Photographs by Walcott, 1912.



FIG. 31.—Surface of Hunga Glacier where the stream flowing over the ice parts so that the branch flowing to the left of the young man (Sidney S. Walcott) goes out to Berg Lake and thence to the Pacific, and that on the right to Lake Adolphus and the Arctic Ocean. At this point the Continental Divide is a hummock of ice upon which the man is standing. Photograph by Walcott, 1912.



FIG. 32.—An outdoor bed-room in the Canadian Rockies.
Photograph by Walcott, 1912.

The stratigraphic section was found to contain approximately 12,000 feet of Cambrian rocks and 3,000 feet of Ordovician, the transition between the two systems of rocks occurring in Billings Butte (figs. 28, 29), which projects upward beside Hunga Glacier. At the northern base of Mumm Peak (figs. 25, 26), above Mural Glacier a new sub-fauna of the Lower Cambrian was discovered, the fossils being beautifully preserved.



FIG. 33.—Harry H. Blagden and Sidney S. Walcott preparing ptarmigan skins for shipment to the Smithsonian Institution. Photograph by Walcott, 1912.

Dr. Walcott was accompanied by Mr. Harry H. Blagden, of the Smithsonian Expedition of 1911, and his son Sidney S. Walcott. The two young men secured a number of fine mammal skins, which have been added to the collections of the National Museum. The collections of the Museum were also enriched by a fine series of fossils from the Burgess Pass quarry, reference to which was made in the report on the expeditions of the Smithsonian Institution of 1910 and 1911 (Smithsonian Miscellaneous Collections, Vol. 59, No. 11, pages 39-43).

FIELD-WORK OF THE BUREAU OF AMERICAN ETHNOLOGY
IN 1912

ETHNOLOGICAL INVESTIGATIONS OF DR. J. WALTER FEWKES IN THE WEST INDIES

One of the most important and interesting lines of research conducted by the Bureau of American Ethnology is that which has been under the immediate supervision of Dr. J. Walter Fewkes, for many years an ethnologist in the Bureau, who has conducted important investigations on the archeology of the West Indies.

The need of making a comprehensive study of the archeology of the West Indies in order to determine the position of the original inhabitants of those islands among the American aborigines was realized several years ago, and the investigation of this field was assigned to Doctor Fewkes who prepared several papers on the results of his work, including "Aborigines of Porto Rico and Neighboring Islands," published in the Twenty-fifth Annual Report of the Bureau. Subsequently Doctor Fewkes's attention was diverted to other fields, but last year Mr. George G. Heye made it possible to resume research in the West Indies, and in October Dr. Fewkes sailed for Trinidad, after spending some time in New York City for the purpose of studying the noteworthy collections of West Indian objects in the Heye museum. On his arrival in Trinidad, Doctor Fewkes made an examination of certain caves near Port of Spain, but found no indication of former troglodytes (cave dwellers). At Erin, a hamlet of French negroes, he found a large shell-heap, the contents of which indicated a high development of the aboriginal occupants, especially in the manufacture of pottery. This pottery has relief decorations, and is painted red, while one of several entire vessels is decorated with incised figures. Doctor Fewkes also recovered about a hundred animal heads of clay, some of which are well modeled, together with typical stone axes and other utilitarian objects.

As objects adequately illustrating the artistic ability of the prehistoric inhabitants of Trinidad are unknown in the museums of Europe or the United States, the collection of beautiful pottery made by Dr. Fewkes in the shell heaps at Erin, opens a new chapter in the history of West Indian culture and immigrations. While it is yet too early to interpret the bearing of these objects on our knowledge of the culture of the prehistoric people dwelling about the Caribbean Sea, it is evident that the prehistoric culture of this island is closely allied to that existing in ancient times on the neighboring coast of Venezuela and quite distinct from the so-called Carib of St. Vincent, Grenada

and the more northern islands. The indications are that the people who made the shell heaps at Erin were not Caribs, but belonged to a stock allied to that of prehistoric Porto Rico of which there were several subdivisions in the West Indies.

Detailed reports of Doctor Fewkes's excavations have not been received in time for incorporation in this article, but to judge from the results obtained during the short period spent in Trinidad prior to the time his report was received, there is every prospect that the study will meet with great success, both from the point of view of subjective material and in collections obtained. At last account, Doctor Fewkes had departed for St. Vincent for the purpose of continuing his studies.



FIG. 34.—A Delaware meeting house, near Copan, Oklahoma, in which the Annual Ceremony, the most sacred institution of the Delawares, is held. Photograph by Michelson.

OBSERVATIONS ON THE FOX INDIANS OF IOWA, AND OTHER TRIBES, BY DR. TRUMAN MICHELSON

In January, 1912, Dr. Michelson visited the Carlisle non-reservation Indian School to obtain information on several Algonquian languages, and in July went among the Fox Indians at Tama, Iowa, from whom a large body of mythological data was obtained. The notes made during this season and the preceding one cover some seven thousand pages. When completely translated, it will make available one of the most exhaustive collections of the mythology of any American Indian tribe. It is noteworthy that these tales differ stylistically from those gathered by the late Dr. William Jones, and this fact helps to bring out more clearly how necessary it is that all

myths should be collected in the original Indian language. The tales collected are exceedingly important in showing the dissemination of myths.

Work was also continued on the social and ceremonial organization. Especially full notes were obtained on the Religion Dance.



FIG. 35.—A Fox woman and her husband. He is one-quarter Fox, one-quarter Potawatomi, and one-half Winnebago. Photograph by Michelson.

All the songs of one of the drums were recorded on a dictaphone, as were some of a second drum. Several photographs of a ball game, were obtained and it is probable that photographs of other ceremonies may be had later.

On leaving Tama, Dr. Michelson proceeded to the non-reservation Indian school at Lawrence, Kansas (Haskell Institute), for the purpose of obtaining notes on several Indian languages.

After a brief stay there, he went among the Munsee of Kansas, where some new information regarding the language was obtained. He then visited the Delaware Indians of Oklahoma, and was gratified to find that many of their ancient customs were preserved almost intact. Elaborate notes were taken of several dances, and observations on the social organization were made.



FIG. 36.—Fox Indians about to start the ball-game, Tama, Iowa. Photograph by Michelson.

On his return east, he stopped at Tama, Iowa, to obtain additional notes on the Fox Indians, as well as to arrange for the purchase of some of their sacred packs, in which work he was successful.

STUDIES OF THE TEWA INDIANS OF THE RIO GRANDE VALLEY BY MRS. M. C.
STEVENSON

Mrs. M. C. Stevenson, who is making a comparative study of the Pueblo Indians, devoted much time in 1912 to investigations into the life of the Tewa people of the Rio Grande valley. She finds that these Indians hold tenaciously to their peculiar beliefs and rituals. Like the Zuñi, they believe in a supreme life-giving power, the symbol and initiator of life and life itself, pervading all space, and called by them "Wowayi." This superior power is the sky. The Tewa conception of this supreme power is similar to the Grecian conception of Athena, and identical with the Zuñi and Taos belief.

The Tewa have religious associations with every mountain peak surrounding them. The most sacred, except Sierra Blanca, is Tsi'komo, or "loose rock," which is a day's journey on foot from San Ildefonso Pueblo. There is a shrine on the summit of the mountain and a large tree trunk is planted and firmly supported by a mound of rock, as a token that Tsi'komo is the greatest of all mountains, except Sierra Blanca, and is the companion of this great peak in southern Colorado.

One of the most interesting ceremonies associated with the moun-

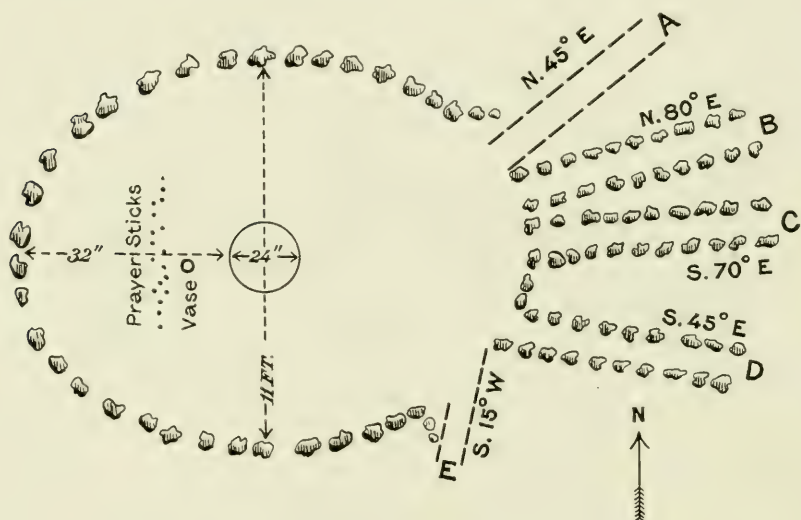


FIG. 37.—Shrine on Mt. Tsi'komo, showing circle of stones, lines of trails to pueblos, vase and prayer-sticks.

tain Tsi'komo is the voluntary initiation of the youth into the fraternities in the kiva, or ceremonial chamber.

Like the Taos, the Tewa are divided into Sun and Ice people. Each group has a kiva, and there is a third room for the accommodation of both parties.

After the initiates and priests have spent four days and nights in the kiva, they make a pilgrimage to the mountain Tsi'komo. Upon reaching a spring far up on the mountainside the party rests for refreshment, which consists only of wafer-like bread. After the repast, the rain priest with his associates, and the elder and younger bow priests, ascend to the shrine where the ceremonies are

conducted. Space will not permit a detailed account of the ceremonies of this ancient ritual.

There is perhaps not a man among the Tewa who can boast of having taken a scalp, but the bow priesthood, or fraternity of warriors, survives, since this organization has important duties to perform aside from going to battle and taking scalps. One of these is to conduct the celebration of the feast of the harvest which occurs only when the people are blessed with bountiful crops, for the cere-

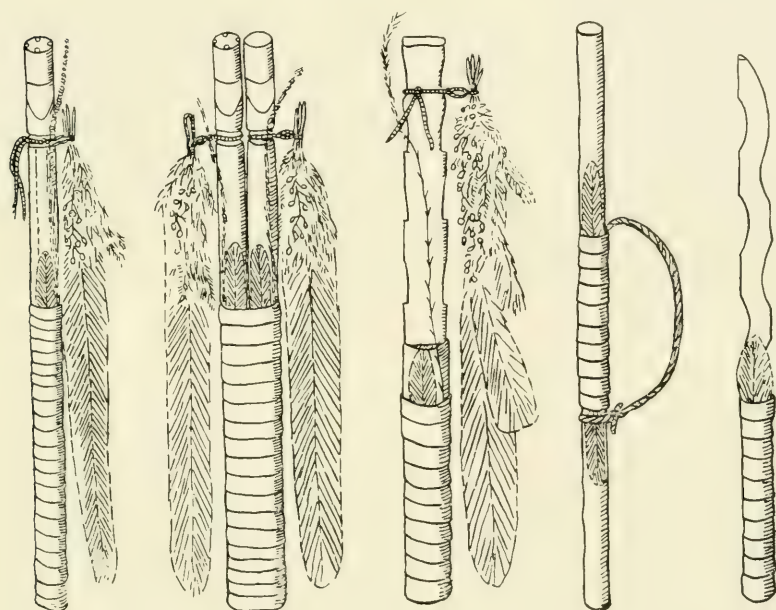


FIG. 38.—Prayer-sticks used in the shrine on Mt. Tsi'komo.

mony is a rejoicing over the harvest of plenty. The dance on this occasion is called the "throwing out." Gifts are thrown in great profusion by the dancers to the populace as evidence of the prosperity of the people.

Another purely aboriginal dance of the Tewa is a dramatic representation of the hunters returning with game, and is called the buffalo dance. It includes extremely attractive impersonations of buffalo, deer, and antelope. The costumes are most elaborate. This feast usually occurs on the twenty-third of January, but occasionally it is omitted, as was the case in the present year



FIG. 39.—Harvest Dance of San Ildefonso. Photograph by Mrs. Stevenson.



FIG. 40.—Harvest Dance of San Ildefonso. Photograph by Mrs. Stevenson.



FIG. 41.—Buffalo Dance, showing Indians representing deer, antelopes, and buffaloes. Photograph by Mrs. Stevenson.



FIG. 42.—Indians executing the Buffalo Dance; San Ildefonso. Photograph by Mrs. Stevenson.



FIG. 43.—Eagle Dance. Photograph by Mrs. Stevenson.



FIG. 44.—Eagle Dance. Photograph by Mrs. Stevenson.

The most graceful figures ever observed by Mrs. Stevenson among any people are those of the eagle dance. Two men impersonate eagles, and the songs are sung by a choir which follows the dancers. The first song refers to the spotted mesa, the second to the white elk, the third to the white eagle, and the fourth to the black eagle.



FIG. 45.—Eagle Dance.
Photograph by Mrs. Stevenson.

INVESTIGATIONS AMONG THE INDIANS OF OKLAHOMA AND TEXAS BY DR. JOHN
R. SWANTON.

From January to May, and again in November and December, 1912, Dr. John R. Swanton was engaged in researches in Oklahoma and Texas. In March he visited a number of places in Texas in the hope of finding remnants of the numerous small Indian tribes that originally lived, or were temporarily located, in various parts of that State. Some information was obtained regarding the fate of the

Bidai Indians of Grimes and Montgomery counties. During the same trip a considerable body of ethnological information and a number of texts were added to what had been collected from the Alabama



FIG. 46.—Sweat house at Chiaha busk ground, Seminole Co., Oklahoma.
Photograph by Swanton.



FIG. 47.—Pakan talahassi busk ground, near Hanna, Oklahoma.
Photograph by Swanton.

Indians of Polk County, Texas, in 1910. In May he also visited one of the four surviving speakers of the Natchez language, near Braggs, Oklahoma, and added considerably to the material, ethnological and

philological, collected there in 1908 and 1910. He now has about 260 manuscript pages of text, besides a large vocabulary of this rapidly dying language.

In the fall Dr. Swanton visited the Alabama Indians again, made further ethnological investigations, and recorded many pages of texts in the Alabama and Koasati languages, besides correcting some which had been previously taken down. A short trip was also made at this time to the Caddo Indians to determine the number of dialects still spoken among them. It was learned that the only two still in use are Nadako and Kadohadacho, which vary very little, although



FIG. 48.—West cabin, Chiaha busk ground. Photograph by Swanton.

considerable is remembered of Natchitoches, and a number of Natchitoches words were recorded. In December he began recording texts in the Hitchiti language, formerly spoken over most of southern Georgia, but now represented by only 20 or 30 speakers among the Creeks and Seminoles of Oklahoma, besides a few Seminoles still in Florida. Among the Creek Indians proper, most of his time was devoted to an investigation of the ancient town and clan organizations, especially as those were represented in the annual "green corn dance" or "busk." Of the 40 or 50 towns originally constituting the Creek confederacy and observing this ceremony, 12 still carry it out in some form or other, but it is scarcely more than a shadow. Nevertheless, with the help of those old men who can remember the ceremonials as they existed before they were broken up by the

internal troubles incident to our Civil War, it has been possible to add a great deal to our knowledge of the ancient Creek confederacy.

STUDIES AMONG THE OSAGE INDIANS BY MR. FRANCIS LA FLESCHÉ

During the year 1912 Mr. Francis La Flesché continued his ethnological studies among the Osage Indians, and his search for articles illustrative of their past life, for preservation by the Smithsonian Institution.



FIG. 49.—Sacred Osage pack. Photograph by Bureau of American Ethnology.

Before contact with the white race, the Osage Indians maintained a tribal organization, and the story of the means agreed upon for its conservation has been transmitted in rituals, songs, and ceremonies, and in certain articles consecrated for use in tribal rites. These rituals, songs, and dramatic acts had to be kept in their original sequence without variation, and a ceremony frequently requires from 18 to 20 hours of continuous effort on the part of the officiating priest.

Among the articles consecrated for use in the tribal rites are two that are regarded by the Osage Indians as the most sacred and significant in their meaning. These are the "burden strap of the woman," and the "sacred bird-hawk of the man."

The Osage tribe is composed of two great divisions, one of which occupies the north side of the tribal encampment, and the other the south side. The divisions are made up of sub-groups, each of which has its part of the general story contained in the tribal rites, and also its sacred article which is kept in ceremonially prepared cases, making a "bundle."

Mr. La Flesche was so fortunate during his stay among the Osage Indians in 1912, as to obtain for the Institution seven specimens of the sacred burden straps, some of which are very old and made of buffalo hide, having been handed down as heirlooms. He also obtained three of the sacred "bundles," one of which is of peculiar interest.

The transferring of this "bundle" to Mr. La Flesche was accompanied by a scene which gave evidence of the reverence with which these ancient and sacred objects are still regarded. Although, in this particular instance, the keeper of the "bundle" and his wife have abandoned the customs and religion of their forefathers and have accepted a new faith, yet the act of parting with this relic of the past awakened the memory of former beliefs in its power for good and ill. When about to give up the "bundle," the wife of its keeper took it outdoors and, standing in the early sunlight, lifted the ancient object to the sun, and while holding it aloft uttered a prayer for its safety, at the same time making an appeal that no harm should befall her household for her act in surrendering forever a sacred charge.

OBSERVATIONS ON BIRDS AND THEIR NESTS, IN NEWFOUNDLAND AND LABRADOR, BY MR. A. C. BENT

Mr. A. C. Bent spent the months of June, July, and August, 1912, in Newfoundland and Labrador, for the purpose of gathering further information and material for the work on the life histories of North American birds, of which the Smithsonian has issued two volumes. During the first month he travelled alone or with a guide, in Newfoundland. A week was occupied in visiting Dr. Leonard C. Sanford's camp on the west coast of the Fox Island River, where he collected a series of crossbills which proved to be a new sub-species.

Mr. Bent then explored the so-called mountains near Gafftopsail in central Newfoundland, a desolate, barren, rocky region, including the highest land on the island, the breeding ground of ptarmigan and greater yellowlegs. He also explored the Humber River, below Deer Lake, visited Grand Lake, collecting about the north end, and spent a week exploring the Sandy River region, including Little Deer Lake and Sandy Lake, which is heavily timbered and good bird country. A number of water birds, such as loons, glaucous and great black-backed gulls, mergansers, and golden-eyes were found



FIG. 50.—Okak, Labrador. Photograph by Bent.

breeding in this region, as well as various interesting forest-loving species of land birds. The remainder of the time, until July 3, was spent in collecting land birds about Bay of Islands.

The trip to Battle Harbor, Labrador, was made by steamer, where the rest of the party, consisting of Mr. Donald B. MacMillan and Mr. J. C. Small, was found waiting with a small power launch. A short run was made southward to St. Peter's Bay to visit some breeding colonies of eiders and other sea birds, after which the party started northward and explored the whole coast, somewhat hurriedly, of course, as far north as Cape Mugford, beyond Okak.



FIG. 51.—The Labrador coast. Photograph by Bent.



FIG. 52.—Ancient Eskimo grave, Okak, Labrador. Photograph by Bent.

Some little time was spent near Hopedale, ten days on the way down and a week on the return trip. A trip was also made inland for a distance of thirty-five miles, and some of the outer islands were visited.

The sea birds on the Labrador coast have been sadly reduced in numbers by many years of constant persecution and persistent eggging. The Alcidae have nearly all disappeared, except the black guillemot,



FIG. 53.—Nests of Northern Eider, Labrador. Photograph by Bent.

which lays its eggs in inaccessible crevices in the rocks. Eiders are still locally common, but are rapidly disappearing; only one large breeding colony was found. Scoters are still abundant in large flocks about the heads of the bays.

Glaucous gulls still breed on the high rocky cliffs where their nests are inaccessible. Great black-backed gulls and herring gulls are still fairly common. Land birds are nowhere abundant, with the possible exception of the white-crowned sparrow, which is a common dooryard bird everywhere. Horned larks, pipits, juncos, Labrador jays, tree sparrows, and redpolls are fairly common.

A NEWLY-DISCOVERED CAVE DEPOSIT NEAR CUMBERLAND,
MARYLAND

In October, 1912, Mr. J. W. Gidley, assistant curator of fossil mammals, in the National Museum, made a preliminary examination of some cave deposits containing bones of Pleistocene age near Cumberland, Maryland, which had previously been discovered and reported by Mr. Raymond Armbruster, a citizen of Cumberland.



FIG. 54.—South side of railroad cut, near Cumberland, Maryland, showing upturned ledge of Heldebergian (Devonian) limestone, partly covered with stalactitic material; bone-bearing deposits seen at base. Photograph by Gidley.

The results were very satisfactory considering the limited time available, upwards of a hundred specimens being secured representing about 24 species of mammals, most of them either extinct or now living only in localities very remote from the mountains of Western Maryland.

The fauna proves very interesting, and the “find” promises to be most important in that it will throw much additional light on our knowledge of the Pleistocene mammals of the eastern United States, or, in other words, those immediately preceding the existing

ones. Among the objects of especial interest collected are a few fragmentary jaws representing a new species of dog as large as the largest living wolves, but with more the character of the fox, or jackal; and a series of upper cheek teeth representing a large extinct species of antelope very closely related to the eland now living only in Africa and the largest of all the antelopes.¹ The deposits were not exhausted and it is intended to continue the examination as further exploration will doubtless add new treasures to the list.



FIG. 55.—Upper Ordovician shales, showing bedding and cleavage, Western Maryland Railroad, west of Williamsport, Md. Photograph by Bassler.

MAPPING THE GEOLOGICAL STRATA AND COLLECTING FOSSILS IN THE VALLEY OF THE APPALACHIAN MOUNTAINS

During the summer of 1912, Dr. R. S. Bassler, curator of paleontology in the U. S. National Museum, spent eight weeks in the Appalachian Valley of Pennsylvania, Maryland, and Virginia, in mapping the rock-strata and collecting fossils. The principal object of this work, which was under the joint auspices of the Maryland

¹ Mr. Gidley's description of this extinct American Eland is to be found in Smithsonian Miscellaneous Collections, Vol. 60, No. 27, March 22, 1913.

Geological Survey and the U. S. National Museum, was to obtain material for volumes on the Cambrian and Ordovician strata of Maryland, to form a part of the series of memoirs published by that State.

This work was done in such detail that it was possible to map the Hagerstown and Williamsport quadrangles of western Maryland, embracing all of the Appalachian Valley in that State. The various formations making up the great Shenandoah limestone series were

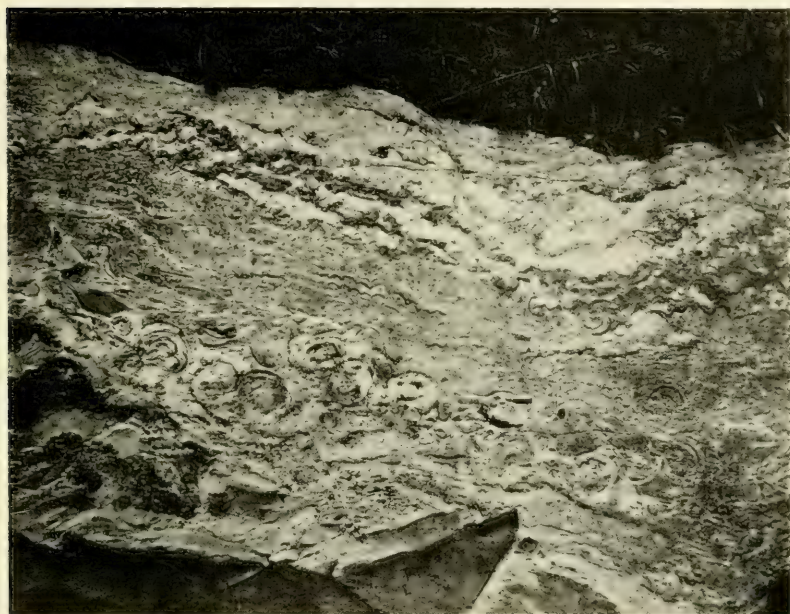


FIG. 56.—Fossil alga, *Cryptozoon*, exposed along the railroad near Antietam Station, Md. Photograph by Bassler.

first studied, with the result that eight distinct formations, aggregating 10,000 feet in thickness, were recognized and mapped. During the process of the mapping, large collections of both rocks and fossils, illustrating all the formations of the Shenandoah limestone, were obtained.

In addition, numerous photographs were taken, showing some of the more interesting features of the geology. Two of these are here reproduced. Figure 56 illustrates a reef of the hydrocoralline or calcareous alga, *Cryptozoon*, as shown on Antietam Battlefield. This reef may be noted wherever the base of the Upper Cambrian (Cono-

cocheague) limestone is exposed, and the rock crowded with rounded heads of *Cryptozoon* affords a unique building stone known as "bull's eye" marble. In figure 55 the cleaved condition of the Upper Ordovician slates illustrates the difficulty of securing well preserved fossils in such a formation, for, as shown here, the cleavage is at right angles to the bedding planes along which the fossils are to be found.

COLLECTING FOSSIL ECHINODERMS IN THE APPALACHIAN VALLEY AND IN MISSOURI

Important discoveries of fossil echinoderms, especially of those known as cystids and crinoids, were made during a long field season in 1912, under the direction of Mr. Frank Springer, associate in paleontology in the U. S. National Museum. Mr. Springer's private collector, Mr. Frederick Braun, started early in the season and made careful researches for crinoids in certain Ordovician formations of the Appalachian Valley which had hitherto received very little study. Localities in Virginia and Tennessee were thoroughly searched, resulting in the discovery of a number of new species and genera, especially of cystids. These are deposited in the National Museum and will form the subject of a monograph by Mr. Springer. Many of the other fossils of these formations were gathered at the same time and have been presented to the Museum by Mr. Springer.

Later in the summer Mr. Braun was detailed to examine certain Lower Devonian strata outcropping along the banks of the Mississippi just north of Cape Girardeau, Missouri, where crinoid stems had been previously noted associated with a peculiar bulb-like organism known as *Camarocrinus*. These bulbs had been considered as free floating organisms of an echinoderm nature, similar in habit to the recent jellyfish, and it was Mr. Springer's wish to ascertain if complete stalks of crinoids could not be discovered in connection with them. After a protracted search for miles along the bluffs facing the Mississippi River, Mr. Braun succeeded in locating the crinoid layer at an accessible point and carried on quarrying operations there for several weeks. The work resulted not only in the recovery of some of the most remarkable specimens of fossil crinoids ever obtained, but in settling finally the fact that *Camarocrinus* is only the bulbous root of the fine crinoid to which the name *Scyphocrinus* has been given in Europe. Four large slabs were obtained having an aggregate weight of 4,500 pounds. Two of these fit together so as to form a single slab 4 feet by 7 feet, and containing

the most important specimens. The locality being several miles distant from any station or landing, it was necessary after crating



FIG. 57.—Slab filled with remains of the very large Crinoid *Scyphocrinus elegans*. Found near Cape Girardeau, Missouri. Photograph by Springer.

the slabs to construct a chute by which they were lowered to the river's level from a rock levee about 35 feet in height. This was

done successfully and the slabs shipped safely to the National Museum, where they are now being prepared for exhibition in the hall of paleontology.

FIELD-STUDIES ALONG THE PATUXENT AND POTOMAC RIVERS,
CHESAPEAKE BAY, AND THE NORTH CAROLINA COAST

Collections of fishes for the National Museum were made during 1912 in the Potomac River and its tributaries from Plummer's Island to Mattawoman Creek, in branches tributary to the Patuxent



FIG. 58.—Power launch *Yorkspit*, and view across Mattawoman Creek, Maryland, one mile above Indian Head docks, a good collecting ground. Photograph by Bean and Weed.

River, and in Chesapeake Bay several miles south of Chesapeake Beach. They were made without expense to the Museum, for the most part by members of the Museum scientific staff while on leave of absence, and were mainly for addition to the exhibition series.

On a one day excursion to Mattawoman Creek, and nearby points on the Potomac, something like 450 specimens representing 26 species were collected. Included among these are specimens of black bass, white and yellow perch, darters, roach, shiners, silver sides, herring, young shad, mummychogs (bull or pike minnows), "spawn-eaters," "smelt" of the Potomac, common eels, catfish, little "mad toms," American sole or hog-choakers, sunfish, or "tobacco-boxes,"

and other varieties of sun-fish, namely, common, long-eared, and blue-spotted.

Several trips were made to Plum Point, on Chesapeake Bay, by Messrs. William Palmer and A. C. Weed, resulting in the collection

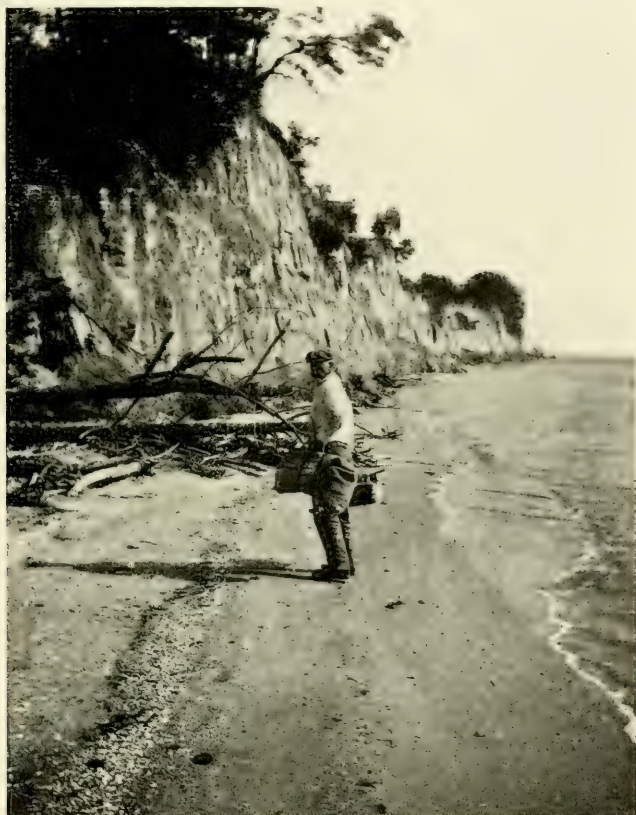


FIG. 59.—Mr. Wm. Palmer on the beach near Plum Point, Chesapeake Bay. Photograph by Weed.

of a number of interesting fishes common to the salt and brackish water of the region. Mr. Palmer also spent some time in digging for fossil cetaceans in the marl banks along the bay.

As in previous years, Mr. Ernest B. Marshall made very interesting collections in small streams tributary to the Patuxent, near Laurel, Md. Messrs. Bean and Weed participated in several of these

trips. Through the generosity of Mr. J. B. Peyton, Jr., the collecting parties were conveyed to various points along the Potomac River in his power launch *Yorkspit*.



FIG. 60.—Dorsal view of a Spotted Sting-Ray, and young, taken at Bight of Cape Lookout, N. C. Photograph by Coles.



FIG. 61.—Ventral view of a Spotted Sting-Ray and young, taken at Bight of Cape Lookout by Russell J. Coles. Photograph by Coles.

Mr. Russell J. Coles, of Danville, Virginia, who made collections around Cape Lookout, North Carolina, sent to the Museum some very interesting fishes, and several photographs, among them an especially interesting picture of a large spotted ray and its young, (figs. 60, 61).

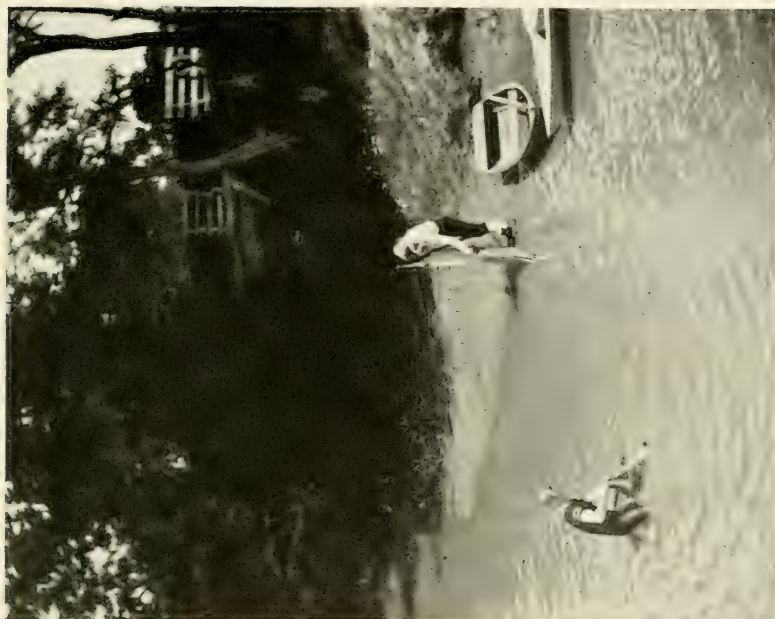


FIG. 63.—Preparing to haul a seine along the shore of Mattawoman Creek; one mile above the docks at Indian Head, Maryland. Photograph by Weed.

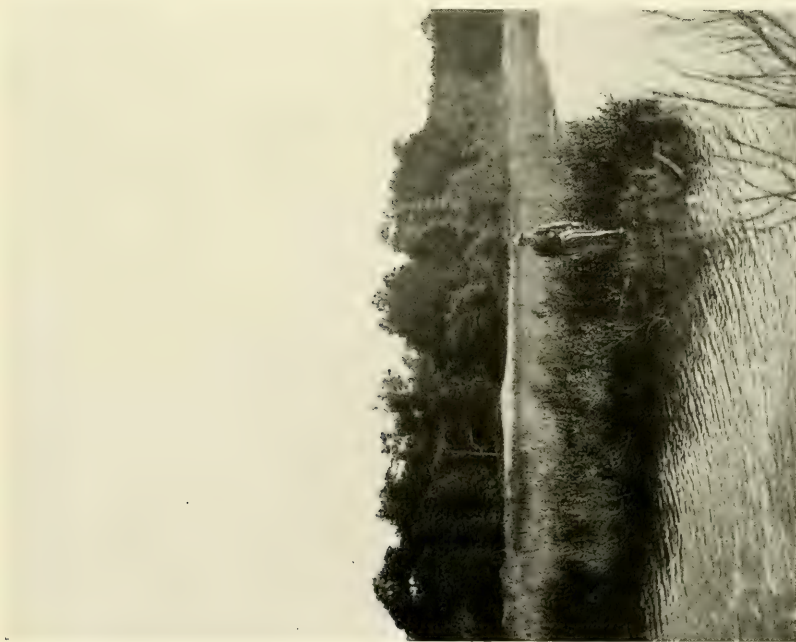


FIG. 62.—Parker Creek, about three miles south of Dare's wharf, Maryland, where specimens of fish were taken. Photograph by Weed.



FIG. 64.—Mr. Wm. Palmer digging for fossils on Chesapeake Bay.
Photograph by Gronberger.

OBSERVATIONS ON MOLLUSKS AMONG THE BAHAMA ISLANDS AND THE FLORIDA KEYS

On the invitation of Dr. Alfred G. Mayer, director of the Department of Marine Biology of the Carnegie Institution, Dr. Paul Bartsch of the National Museum joined an expedition on the steamer *Anton Dohrn* to the Bahama Islands, the main object being a study of the marine mollusks of that region in their natural surroundings, with special reference to the boring and nestling organisms associated with corals.

Incidentally a trip was made by motor boat up the Miami River, and along the Everglade drainage canal; as well as several visits to the off-lying keys. Collections were made in all these places and careful notes bearing upon faunal associations were taken upon all the material gathered. The region about Miami is extremely well suited for observations of this kind, as it presents many different

conditions in the narrow space between the main shore and the outer beach of the off-lying keys, each of which is occupied by a peculiar faunal assemblage.

On April 28, 1912, the party crossed the Gulf Stream and proceeded to Nassau, New Providence, where collections were made of living mollusks, and a fine series of the fossil mollusk, *Cerion agassizi* Dall, was obtained.

The party then went to Andros Island. Here the marine mollusks proved rather disappointing, there being but few species and these,



FIG. 65.—The laboratory, "White House," near Sharp Rock Point, Andros Island. Photograph by Bartsch.

as a rule, were few in number. The land shells were far more interesting, the genus *Cerion* in particular offering some most interesting problems.

Andros Island is a collective term applied to a whole host of minor keys that are separated by tortuous channels of varying width and depth. Practically every key examined, no matter how small, provided it bore vegetation, was found to be inhabited by *Cerions* of the *C. glans* group. The shells on each key present differences sufficient to enable one to distinguish them. For example, in size alone, 500 of those collected about Bastion Point filled a 3-pint measure, while the same number from the neighborhood of our temporary laboratory,

the "White House," near Sharp Rock Point, required a 5-pint measure to contain them. There are also other characteristics besides differences in size.

On account of the many puzzling phenomena regarding their distribution, it was thought desirable to gather large series of specimens of *Cerion* and associated mollusks for careful study and experimentation.

Of *Cerion* alone about 40,000 specimens were collected from as many localities as possible. This was done with the idea of intro-



FIG. 66.—Two races of Bahama shells (*Cerion*) planted by Dr. Bartsch on keys between Miami and Tortugas, Florida. Photograph by National Museum.

ducing some of them into other islands, so that the effect of a change of environment could be studied later.

The party returned to Nassau on May 26, and then set sail for Miami, where it remained until the end of the month. During this time a fine series of that most beautiful of all North American land shells, *Liguus*, was secured, as well as a goodly number of other species. A number of dredge hauls were made north of Cape Florida, in shallow water, by the *Anton Dohrn* and a fine series of marine invertebrates secured.

On May 31 the expedition sailed south for Key West. On this cruise, and during the stay at Miami, the two races of Bahama *Cerions* were introduced at different points.

During the cruise from Miami to Key West, a special effort was made to examine as many of the keys as could be reached conven-



FIG. 67.—One of the commonest shells on the Bahama eroded rock beaches, *Tectarius muricatus* L. Photograph by Bartsch.

iently for *Cerion incanum* Binney, and, wherever found, to gather as large a series as possible. It was observed that most of the keys

which had been flooded during the hurricanes of 1906 and 1910, contained practically no live *Cerions*, though dead ones were observed in a number of places, and this caused one to wonder whether seawater might serve as a decided barrier to these forms.

Little is known about the life history of *Cerions*. They are remarkably variable, usually very restricted in their distribution, and very abundant where they occur. They are very tenacious of life, specimens having been kept in the U. S. National Museum for more than eight years; these occasionally leave the tray in which they are placed and seek a new resting-place. *Cerions* are also not particular about specific food, in fact they might be looked upon as "the goats" among the mollusca. They are furthermore not readily affected by changes in temperature. All these features indicate a remarkably desirable subject for investigation, and the hope is entertained that the various experiments to which they might be subjected will yield information enabling one to understand what is meant by the protean nature of this group.

During this cruise careful color notes on about 160 marine animals were made, which were found very desirable in retinting the specimens which are now being installed in the faunal marine invertebrate exhibit of the National Museum.

COMPLETION OF THE SMITHSONIAN BIOLOGICAL SURVEY OF THE PANAMA CANAL ZONE

In carrying on the biological survey of the Panama Canal Zone, inaugurated in 1910, the Smithsonian had the coöperation of several government bureaus, including the Bureau of Fisheries of the Department of Commerce and Labor; the Bureau of Entomology and the Biological Survey of the Department of Agriculture; the Isthmian Canal Commission, and the Panama Railroad Company, under the War Department, etc. The Field Museum of Natural History of Chicago also took part in the investigation of the fish faunas.

The field-party for 1912 included Mr. E. A. Goldman, of the Biological Survey, Mr. August Busck, of the Bureau of Entomology, and Dr. Charles D. Marsh, of the Bureau of Plant Industry, all of the Department of Agriculture; also Professor H. Pittier, of the same Department, who remained in the field during nearly the whole period of the survey. Dr. Seth E. Meek represented the Field Museum, and Mr. S. F. Hildebrand, the Bureau of Fisheries.

The first party sailed from New York on the *Panama* on January 9, 1912, and arrived at the Canal Zone January 15, whence the different members departed for their respective collecting grounds.

Arriving at Empire in the middle of January, Mr. E. A. Goldman immediately began collecting mammals, and on February 21 went to Real de Santa Maria in Eastern Panama, where he endeavored to determine the faunal relations of this region with the Canal Zone



FIG. 68.—Cana, eastern Panama, headquarters of the Darien Gold Mining Co. Used as the base of field operations in the Pirri mountains. Photograph by Goldman.

and the areas lying to the westward and northward. His efforts were centered around the Pirri Mountains, one of the highest ranges in eastern Panama, rising to a height of over 5,000 feet, and located near the Colombian boundary, southeast of San Miguel Bay. In this work he was most successful. The region is covered with a dense

unbroken forest and has a heavy annual rainfall, although at the lower levels it is usually dry from January to April, except for the almost constant fog. The collections secured by Mr. Goldman, which are deposited in the National Museum, include some 800 birds



FIG. 69.—Forest at 5,200 feet elevation, Pirri Mountains, eastern Panama; composed largely of palms and including many tree ferns. Photograph by Goldman.

and about 600 mammals. From the studies thus far made upon them, they appear to strengthen the view that the fauna of eastern Panama is South American in its general characteristics. Among them are many new forms, some of which have been described by Messrs. Goldman and Nelson in the Smithsonian Miscellaneous Collections.

Mr. Goldman returned to his headquarters at Empire, from Darien, in order to ship specimens, but again entered this region to complete his work in the lower elevations and remained there until early in July. During the time spent at Darien, Mr. Goldman states that his efforts were greatly facilitated and his expenses much reduced, through the aid rendered him by the Darien Gold Mining Company.



FIG. 70.—A part of the Pirri Mountains, eastern Panama, as seen from 1,800 feet altitude, in Cana Valley. Photograph by Goldman.

Dr. Seth E. Meek, of the Field Museum of Natural History, and Mr. S. F. Hildebrand, of the Bureau of Fisheries, who again participated in the work of collecting and studying the fishes of the Zone, arrived at Cristobal on January 15, 1912, and commenced work almost immediately. During the previous expedition, the collecting was confined mainly to the fresh and brackish waters of the Canal Zone and the immediate vicinity, but on this trip most attention was devoted to the salt-water fauna. On the Pacific Coast this was carried on from three points—Panama, Balboa, and Chamé Point, and on the Atlantic coast from four different points—Cristobal,

Colon, Toro Point, and Porto Bello. Large collections were secured from both coasts.

Besides the salt-water collecting, the work was extended to the fresh waters on the Pacific slope a short distance to the east and west of the Canal Zone, in order to obtain a better understanding of the distribution of the fresh-water fishes of the Pacific coast streams than was obtainable from the small streams opposite the



FIG. 71.—Steamer *Cana* of the Darien Gold Mining Co., on which a trip was made from Panama City to Marraganti on the Rio Tuyra, eastern Panama. Photograph by Goldman.

Rio Chagres, and especially from the Rio Grande, because of the changes in this stream due to the work on the Canal.

The party continued operations for about three months, and much help was given by the Isthmian Canal Commission, the Panama Railroad and Steamship Company, and the Darien Gold Mining Company, to all of which organizations many thanks are due.

Upon his arrival in Panama on February 9, 1912, Mr. August Busck, of the Bureau of Entomology, was at once enabled to establish headquarters in the convenient comfortable dispensary in

Paraiso, through the courtesy of the Canal Commission. Here he made arrangements for visiting the islands of Taboga and Taboguilla



FIG. 72.—Waterfall from a small side-stream on the Rio Grande, near Cana, Darien, Panama. Photograph by Hildebrand.



FIG. 73.—Hydrographic Gauging Station, above Alhajuela, Panama. Photograph by Busck.

where certain conditions regarding mosquitoes, observed in 1911, suggested closer investigation.

Mr. Busck first spent a week on Taboguilla Island, which was at that time uninhabited, and was supplied with provisions by a daily boat from Taboga. It being in the height of the dry season, he established his camp with a mosquito-netted cot, acetylene lamps, and collecting sheets, halfway up the hillside, with no cover other



FIG. 74.—Cocoanut Palms, Paraiso, Panama; one normal, the other denuded by caterpillars. Photograph by Busck.

than a large mango tree. He then spent a week on Taboga Island, and early in March went up the Chagres River, making his headquarters in the gauging station at Alhajuela, and from that point explored the surrounding country, mainly along the tributaries of the Chagres and Chilibri Rivers, and especially the extensive limestone-cave region, which he had visited in 1911. On this trip he camped on the banks of the Chilibrillo River under the open sky,

and investigated the caves more thoroughly than had been possible previously. It was found that there is an upper series of dry caves and a lower series containing water. In the rainy season these latter become inaccessible subterranean rivers, and it was in them that the interesting bat-fauna was found, which Mr. G. S. Miller, Jr. has described in the Proceedings of the U. S. National Museum.

The last part of March was spent on the upper Trinidad River where exceedingly rich entomological results were obtained, partly through the night work with the acetylene lamps. Early in April Mr. Busck went to Porto Bello on the Atlantic side. From that



FIG. 75.—Porto Bello Bay, showing excavation in the mountain, where the rock used for the Gatun Dam was secured. Photograph by Busck.

place he made several trips with good results, but on one of these, up the coast to the Santa Rosa River, he unfortunately became ill and was forced to go to a hospital. Having recovered, he proceeded a week later to La Chorrera where the rainy season was at its height and the collecting proved excellent. He established himself there for two weeks, collecting beyond the savannah area in the foothills near the origin of the Trinidad River. The acetylene lamps and the white trap-sheets proved valuable adjuncts to the outfit, and much material was secured by collecting at night.

The last part of May was occupied with minor excursions in or near the Canal Zone; among these a short trip up the Chagres River. On June 1, he undertook a second trip up the Trinidad River, and found conditions quite different from what they were before, owing



FIG. 76.—Dry-season camp on Taboguilla Island, showing white sheets and acetylene lamp for night-collecting. Photograph by Busck.



FIG. 77.—Palms "up to their knees" in water; Trinidad River valley, Panama, now part of Gatun Lake. Photograph by Busck.

to the damming of the Gatun Lake. The old trails through the swamp and forest were flooded knee-deep, and the water rose half a foot a day during his stay. This handicapped the collector's work considerably, as all the operations had to be carried on from a dugout canoe. The remaining hilltops, however, proved all the richer in insect life, as well as in other animal life. The augmentation of the



FIG. 78.—Tied up for the night, on the upper Chagres River. Photograph by Hildebrand.

mosquito fauna proved as interesting as it did annoying to the collector.

About the middle of June, Mr. Busck returned from this locality, which in another few months would become totally submerged, departed for New York, and arrived in Washington June 24.

Dr. C. D. Marsh, of the Bureau of Plant Industry, accompanied the survey party to the Canal Zone to make typical collections of the plankton organisms in the fresh waters of the Atlantic and Pacific slopes of the Isthmus. He arrived at Cristobal on January 15, 1912,

established his headquarters at Empire, and remained in the field until February 16.

The topography of the Zone is such that it is not a particularly good collecting ground for plankton. The region visited is practically destitute of lakes, there are but few permanent pools, and although the lowlands of the Atlantic slopes form a huge swamp, the waters in this locality are so connected that no great variety of forms is found. The south slope is abrupt, with no permanent bodies of water, and the streams are small and more or less temporary.



FIG. 79.—Rio Grande Reservoir, Canal Zone, showing workmen clearing the shores to prevent decaying vegetation from falling into the water. This is an old reservoir dating from the time of the French occupation. Photograph by Marsh.

Especial attention was paid to the old reservoirs which form little lakes, and ordinarily would contain some of the typical flora and fauna of the immediate region, but these bodies of water are "plankton poor," as compared with similar bodies in a temperate climate; for, inasmuch as the temperature of the air is practically uniform throughout the year, there is no vertical circulation of the water, except where it is shallow enough to be affected by the winds. The conditions at the bottom of the deeper waters of the reservoirs are such as to make life impossible. Careful collections were made

from all these reservoirs and the streams supplying them, from the embryonic Gatun Lake, its adjacent swamps, and from the waters



FIG. 80.—Rocky Island in Panama Bay, showing Frigate birds. Plankton collections were made near this spot. Photograph by Marsh.



FIG. 81.—Collecting Entomostraca in Black Swamp, Canal Zone. This locality will be covered by Gatun Lake. Photograph by Marsh.

of the Chagres and Trinidad Rivers, as well as from the streams and pools of the southern slope, and in the harbors of Colon and

Panama. Owing to the short time available for this work, very little collecting was done outside the Zone. While these collections have been examined only in a preliminary way, enough has been done to make it evident that there are some distinct differences in the faunas of the two sides of the Isthmus.

Professor Henry Pittier, of the Department of Agriculture, who has had charge of the general botanical collecting for the survey since its inception in 1910, remained in the field to continue his work, especially the collecting of ferns and lower cryptogams, from May, 1912, throughout that year. An anticipated trip to the Darien country was postponed on account of an accident to the only steamer plying between Panama and the ports of Darien, which forced Professor Pittier to remain in Culebra until January 23, 1912. A little later he secured passage to Darien where he explored the Cugra River and the Sambu Valley near Garachine Point.

Following the completion of his trips in south Darien and to Chiriqui, he went to Venezuela, whence he will return to the United States about April, 1913.

BOTANICAL OBSERVATIONS BY DR. J. N. ROSE IN EUROPE AND IN KANSAS

Dr. J. N. Rose, Associate in Botany, U. S. National Museum, at present detailed to the Carnegie Institution for the purpose of making an exhaustive study of the Cactaceæ of America, spent several months visiting the botanical gardens and institutions of Europe, and making preliminary arrangements for various exchanges. Among the places visited were the Kew Gardens, the Jardin des Plantes at Paris, the Conservatory and Botanical Garden at Geneva, the Royal Botanical Gardens at Munich and Berlin, and the Hanbury Botanic Garden in northern Italy. This last is a private garden belonging to Lady Katherine Hanbury and known as the *Hortus Mortolensis*. It lies on the shore of the Mediterranean in the little Italian village of La Mortola, about half way between the towns of Ventimiglia, Italy, and Mentone, France, in the most beautiful part of the Riviera, and during the winter and spring is the main feature of interest in all that region. Its area comprises 112 acres. The most broken and rugged parts are allowed to grow wild; some of the hills being covered by groves of native pines which suggest the hemlocks in the New York Botanical Garden. The other parts of the grounds have been beautifully terraced with convenient walks and stone steps, from which can be seen, through vistas here and

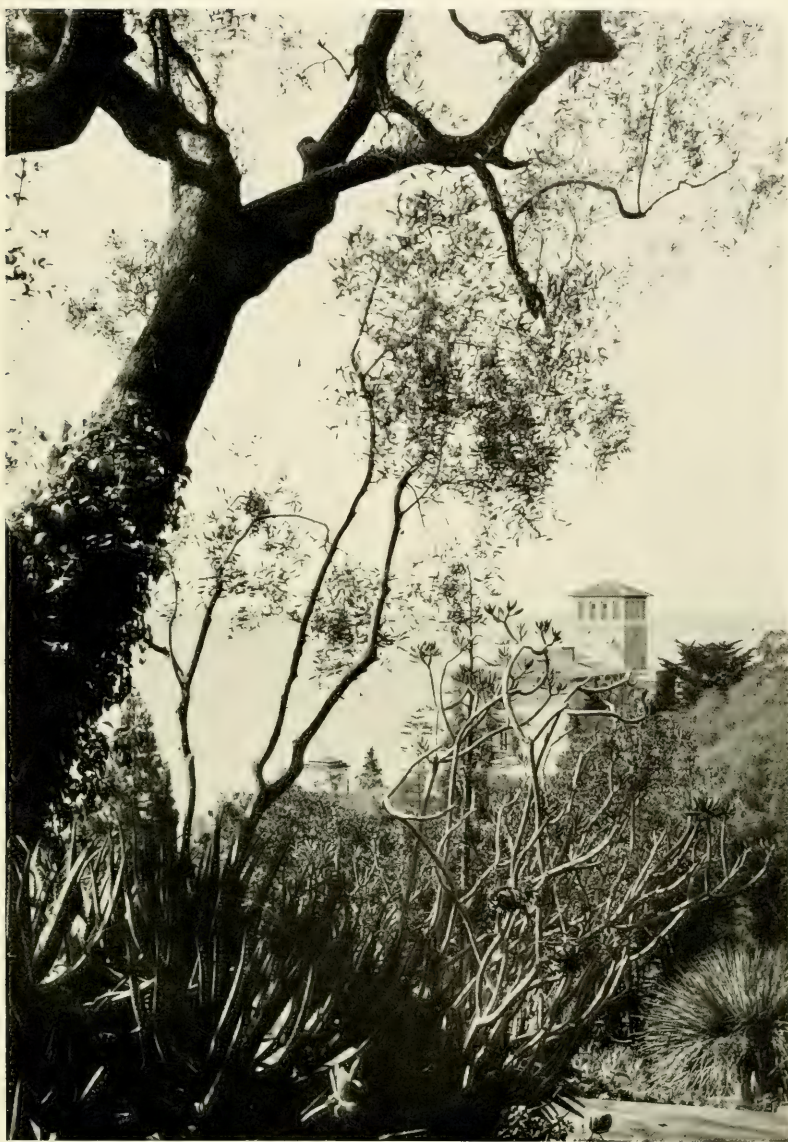


FIG. 82.—View of the Hanbury Botanic Garden from the northeast, showing olive tree and aloe plant on the left. Photograph by Nenke and Ostermaier, Dresden.

there, the Mediterranean and the nearby hills and mountains. The garden is more than simply a pleasure ground. It has been developed by Mr. Alwin Berger so as to be of great scientific value. The amount of material sent out for exchange purposes, both in the way of seeds and living plants, is enormous. A collection of succulent plants which has no counterpart in the world, and is well suited to the dry, hot summers of this region, has been assembled, and this place is fast becoming the Mecca for the study of such plants. No student of desert plants of America or South Africa can afford to omit this garden from his itinerary when visiting Europe. In connection with the garden there is a small museum building, a library, and an herbarium.

In September, Dr. Rose in company with William R. Fitch, made a botanical excursion through the western part of Kansas, collecting cactaceae and other flowering plants. Although the region is extremely arid, a very fair collection was made. A full set of this material, as also from the collection made by Dr. Rose in Europe, has been deposited in the U. S. National Herbarium.

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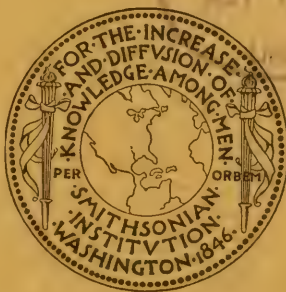
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SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 63, NUMBER 8

EXPLORATIONS AND FIELD-WORK OF THE
SMITHSONIAN INSTITUTION
IN 1913



(PUBLICATION 2275)

CITY OF WASHINGTON
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Looking north from foot of Kinney Lake toward Whitehorn Peak. On the right the cliff at the foot of Robson Peak. Miss Helen B. Walcott on beach in foreground. Robson Park, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

EXPLORATIONS AND FIELD-WORK OF THE SMITHSONIAN INSTITUTION IN 1913

INTRODUCTION

There is here presented a general account of the exploration and field-work conducted by the Smithsonian Institution and its several branches, including the United States National Museum, in various parts of the world during the calendar year 1913. These explorations were made by means of allotments from the Smithsonian funds, from Congressional appropriations, and through the coöperation of other institutions and of individuals engaged or interested in geological, biological, or anthropological investigations.

The Institution and its branches were thus represented in a large number of field parties whose researches have tended to increase the general knowledge in various subjects, and have added much valuable material to the collections of the National Museum. Owing to its limited funds, the Institution was unable to participate in several additional enterprises in which opportunities for representation were offered.

In the preparation of the present account the direct statements of those who participated in the field-work have been employed, with one or two exceptions, while nearly all the photographs were made by the explorers themselves.

Some of the work carried on in 1913 was in continuation of operations begun in previous years and reported in part in accounts heretofore published by the Institution.¹

Three Government branches of the Institution are represented in this report: The National Museum, although having no specific funds for exploration work, avails itself as far as possible of all opportunities presented for making collections in the field; the Bureau of American Ethnology engages largely in field-work, which is covered in detail in the annual report of that bureau; and the

¹ Expeditions Organized or Participated in by the Smithsonian Institution in 1910 and 1911. Smithsonian Misc. Coll., Vol. 59, No. 11, 1912.

Explorations and Field-Work of the Smithsonian Institution in 1912. Smithsonian Misc. Coll., Vol. 60, No. 30, 1913.

Astrophysical Observatory at times conducts special expeditions both in the United States and abroad, in connection with its regular work of studying the physical properties of the sun and their effect on the earth.

Both the National Museum and the National Zoological Park received during the year many donations and accessions presented or collected by collaborators in this country and abroad who have no official connection with either branch. The remaining branches under the Smithsonian Institution were not represented by any field parties, and therefore are not mentioned in this account.



FIG. 1.—Looking northeast toward the top of Robson Peak from Rainbow Brook, one-quarter mile south of Lake Kinney, Robson Park, British Columbia, Canada. Photograph taken while clouds and mist were drifting over the upper part of the peak. The summit of the peak is 8,800 feet above the camera. The view shows the southwest face of the peak. Photograph by C. D. Walcott, 1913.

GEOLOGICAL EXPLORATIONS IN THE CANADIAN ROCKIES

In continuation of his previous geological researches in the Canadian Rockies, Dr. Charles D. Walcott, Secretary of the Institution, revisited during the field season of 1913, the Robson Peak district in British Columbia and Alberta, and the region about Field, British Columbia. At the latter place he received the members of the International Geological Congress.



FIG. 2.—Robson Peak from a ridge above and north of east end of Berg Lake, showing north side of peak. Robson Park, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

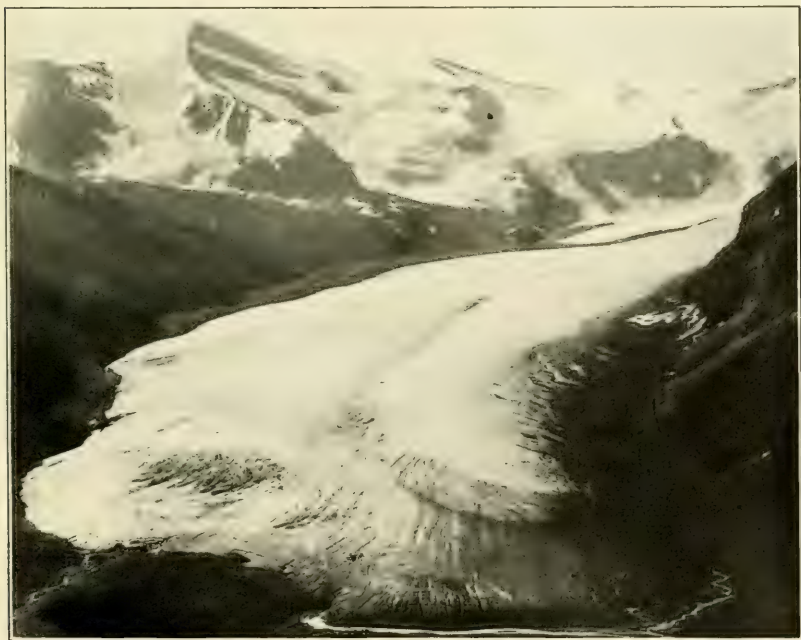


FIG. 3.—Hunga Glacier from south slope of Mumm Peak, with Phillips and other mountains to the south. Robson Park, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

On this trip to Robson Peak, Dr. Walcott approached from the west side, in order to study the local geological section which he considers one of the finest in the world. From the west foot of Robson Peak, Whitehorn Peak rises on the north to a height of 7,850 feet above Lake Kinney (frontispiece), and on the east the cliffs of Robson rise tier above tier from the surface of the lake to the summit of the peak, a vertical distance of 9,800 feet. The base of this geo-



FIG. 4.—Phillips Mountain, from Robson Pass, looking over the front of Hunga Glacier. Robson Park, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

logical section is shown on the right of the frontispiece, and the upper half by figure 1, while figure 2 illustrates a profile of 7,500 feet of the section.

From beneath the base of the mountain at Lake Kinney, the strata slope gently upward so that more than 4,000 feet in thickness of beds, which pass under Robson Peak, are exposed in ledges to the north and south. A considerable portion of this thickness is shown in the dark peak to the left of Whitehorn Peak in the frontispiece.

Owing to exceptionally good climatic conditions, the season of 1913 proved unusually favorable for viewing Robson Peak. Fre-



FIG. 5.—Brook entering Berg Lake, one mile southwest of Robson Pass. View taken about half a mile from the lake. Robson Park, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

quently in the early morning the details of the snow slopes on the summit of the peak were beautifully outlined. Toward evening,

however, the mists driven in from the warm currents of the Pacific, 300 miles away, shrouded the mountain from view (fig. 7).

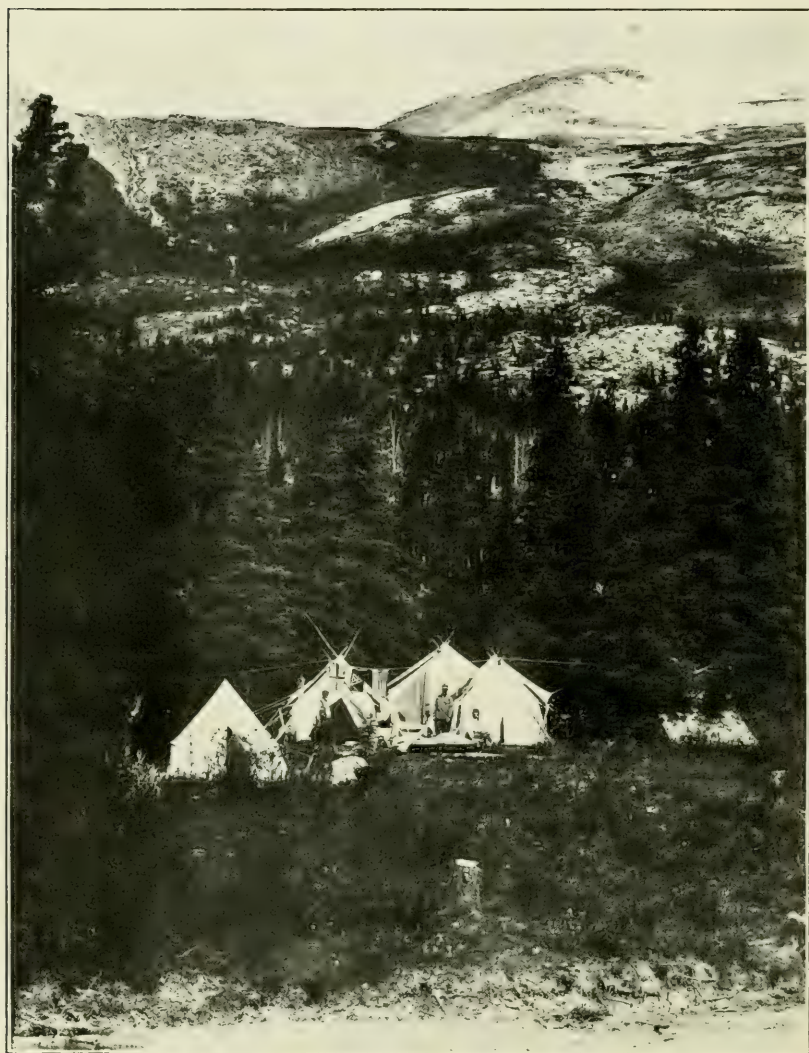


FIG. 6.—Camp on the north side of Robson Pass.
Photograph by C. D. Walcott, 1913.

From the slopes of Titkana Peak, west of the great Hunga Glacier (figs. 3 and 4), a wonderful view is obtained of the snow fields and falling glaciers east of Robson Peak. The glacial streams come



FIG. 7.—View from Walcott Camp, looking westward over President Range when the mist is driving eastward over the mountains. Near Field, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

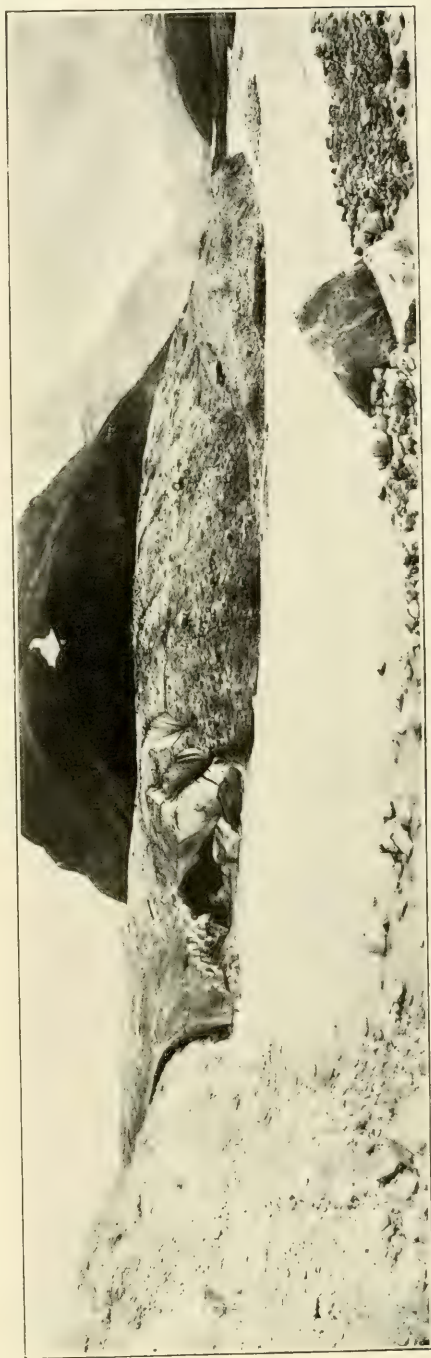


FIG. 8. Panoramic view of west side of foot of Hunga Glacier where the stream forming the head-waters of Grand Fork comes from beneath the ice and flows westward into Berg Lake. Robson Park, British Columbia, Canada. Photograph by C. D. Walcott, 1913.



FIG. 9.—View looking out from the fossil quarry over Burgess Pass, to the right of the mountain, the Van Horne Range in the distance, the President Range and Emerald Lake. On the left the Kicking Horse Valley, Mount Dennis, and in the distance Mount Vaux. Near Field, British Columbia, Canada. Photograph by C. D. Walcott, 1913.



FIG. 10.—North end of the fossil quarry above Burgess Pass on the slope of the ridge between Mount Wapta and Mount Field, 4,000 feet above Field, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

tumbling down the slopes (fig. 5) and often disappear beneath the glacier to reappear at its foot with the volume of a river (fig. 8).

At Field, British Columbia, work was continued at the great Cambrian fossil quarry, where a large collection of specimens was secured. The conditions were such that it was necessary to do much heavy blasting to reach the finest fossils which occur in the lower layers of rock. Figure 10 shows the north end of the quarry below the sharp



FIG. 11.—South end of fossil quarry, where many of the most beautiful specimens were secured from the lower three feet of beds. Near Field, British Columbia, Canada. Photograph by C. D. Walcott, 1913.

summit of Mount Wapta, and, in the distance, the President Range with Emerald Lake at its base. The south end of the quarry is illustrated by figure 11; here the solid beds were blasted out to a depth of 22 feet.

Owing to the presence of a fault line, just north of the quarry, and the twist and compression of the rocks south of it, the available area for successful collecting is limited to about 200 feet. In other localities where the shale outcrops on the ridges in the vicinity, com-



FIG. 12.—View of the west cliff of the valley of the Thousand Falls. On the trail from Lake Kinney to Berg Lake. Photograph by R. C. W. Lett, Grand Trunk Pacific Railway, 1913.



FIG. 13.—Summit of Mount Resplendent, with the mist driving over the three members of the Alpine Club of Canada. Photograph by P. L. Tait, British Columbia, 1913.

pression and shearing have so changed the character of the rock that it is impossible to obtain fossils in a condition to be of service.

The collections of 1913 contain a number of very important additions to this ancient Cambrian fauna, and many fine additional examples of species found in 1912.



FIG 14.—Boulder train on the surface of the west side of Hunga Glacier, overlooking the Robson Pass, British Columbia. The Secretary of the Smithsonian Institution is standing beside the boulder. Photograph by Miss Helen B. Walcott, 1913.

GEOLOGIC HISTORY OF THE APPALACHIAN VALLEY IN MARYLAND

Dr. R. S. Bassler, curator of paleontology in the U. S. National Museum, spent a month during the summer of 1913, in the Appalachian Valley of Maryland and the adjoining States, studying the Postpaleozoic geologic history of the region, as indicated by the present surface features. His studies, which were under the joint auspices of the U. S. National Museum and the Maryland Geological Survey, were in continuation of work carried on during the previous summer when the sedimentary rocks of the region were mapped in detail, the final object being the preparation of a report on the Lower

Paleozoic strata of Maryland, to complete a series of memoirs published by that State. Owing to the brevity of this account, only a few points in the physiographic history will be noted here.

Since Carboniferous time western Maryland has been above the sea, and its rocks have accordingly been subjected to a long period of aerial erosion. During Jurassic time, the area remained stationary for so long a period that the surface of the land in the Appalachian province was reduced to a rolling plain. Later uplift raised this



FIG. 15.—Jurassic (Schooley) peneplain, preserved in the Blue Ridge of Maryland. Photograph by Bassler.

plain still higher above sea level, and in Maryland only remnants of the old surface are preserved in the flat skyline of the highest mountains. This ancient plain, or Schooley peneplain, as it is termed, is well preserved on the top of the Blue Ridge, as shown in figure 15.

A second great period of erosion occurred in early Tertiary time, the effects of which were chiefly in the Appalachian Valley proper, where the erosion is indicated by a pronounced plain at an elevation of about 750 feet. This plain was formed only on the softer Paleozoic rocks, and, because of its prominence near Harrisburg, Pennsylvania, is known as the Harrisburg peneplain. Conococheague Creek traverses the Harrisburg peneplain in Maryland, and has dissected it

considerably, as shown in figure 16, but the even skyline of the ancient plain is still clearly evident.

Other factors in the geologic history of Maryland are recorded in the well defined gravel terraces along the major streams of the area and in great alluvial fans of large and small boulders, spreading out at the foot of the larger mountains and sometimes reaching a depth of 150 feet. All of these phenomena have been plotted and will form a part of the geologic map of the region.



FIG. 16.—Dissected Early Tertiary (Harrisburg) peneplain, west of Hagerstown, Maryland. Photograph by Bassler.

COLLECTING FOSSIL ECHINODERMS IN ILLINOIS

The special field explorations maintained by Mr. Frank Springer, associate in paleontology in the U. S. National Museum, were continued during the season of 1913 by his private collector, Frederick Braun. The purpose of these explorations is to obtain additional material for use in Mr. Springer's monographs upon the fossil crinoidea, now in course of preparation, but they also result in important accessions of excellent specimens for the completion of the exhibition series in the hall of Invertebrate Paleontology in the National Museum.

The investigations of the past summer were confined to the Kaskaskia rocks of Monroe and Randolph Counties, Illinois. They were systematically carried on in connection with the geological work for the State of Illinois, in progress at the same time under the direction of Professor Weller, in order to have the benefit of accurate determinations of the horizons from which the collections were made, with reference to the several subordinate formations into which the

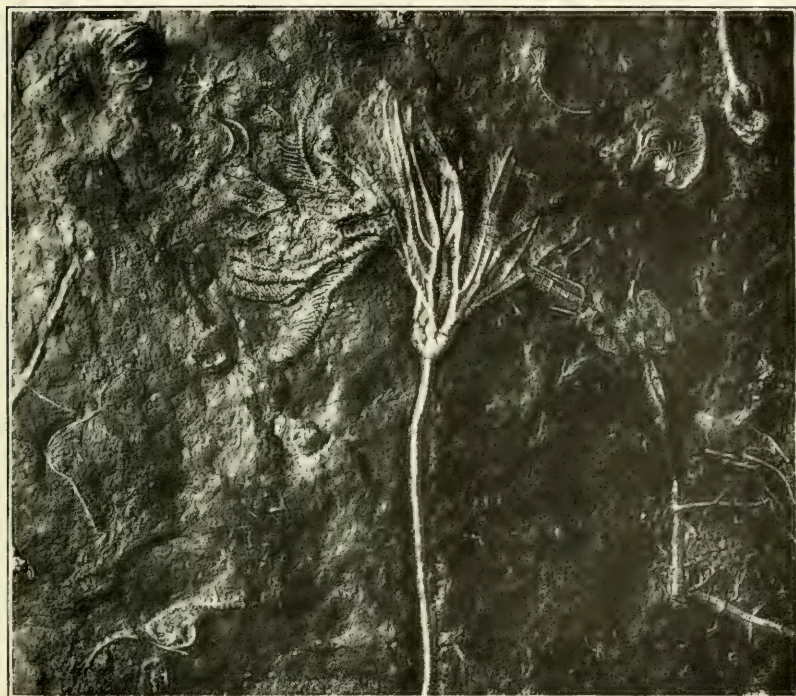


FIG. 17.—Portion of a slab of fossil Crinoids from Illinois.
Photograph by National Museum.

Kaskaskia of that region is divided. In this way it was hoped to rectify some confusion as to the stratigraphic relation of a number of species described in the Geological Reports of Illinois and Iowa. The operations were successful in this respect, and at the same time six large boxes of fine specimens were obtained. Among the specimens there are a number of slabs covered with Crinoids not hitherto found in that formation, in an excellent state of preservation. A portion of one slab, containing 22 specimens of 9 different species, is shown in the accompanying illustration (fig. 17). This specimen and

others of similar character, giving a complete representation of the Kaskaskia crinoidal fauna, are being prepared for installation in the exhibition hall of the National Museum.

FURTHER EXPLORATION OF THE CUMBERLAND PLEISTOCENE CAVE DEPOSIT

In May, 1913, Mr. J. W. Gidley, assistant curator of fossil mammals in the U. S. National Museum, made a second visit to the Pleistocene cave deposit near Cumberland, Maryland, which proved even



FIG. 18.—Near view of part of excavation made near Cumberland, Maryland, by U. S. National Museum party. Photograph by Armbruster.

more successful than the one of the previous year, reported in the account of the Smithsonian explorations of 1912.

Many new forms were added to the collection, and much better material was obtained of several species represented only by jaw fragments in the first collection. The collection now contains upward of 300 specimens, representing at least 40 distinct species of mammals, many of which are now extinct. Among the better preserved specimens are several nearly complete skulls and lower jaws. The more important animals represented are two species of bears, two species of a large extinct peccary, a wolverine, a badger, a martin, two porcupines, a woodchuck, and the American eland-like antelope.

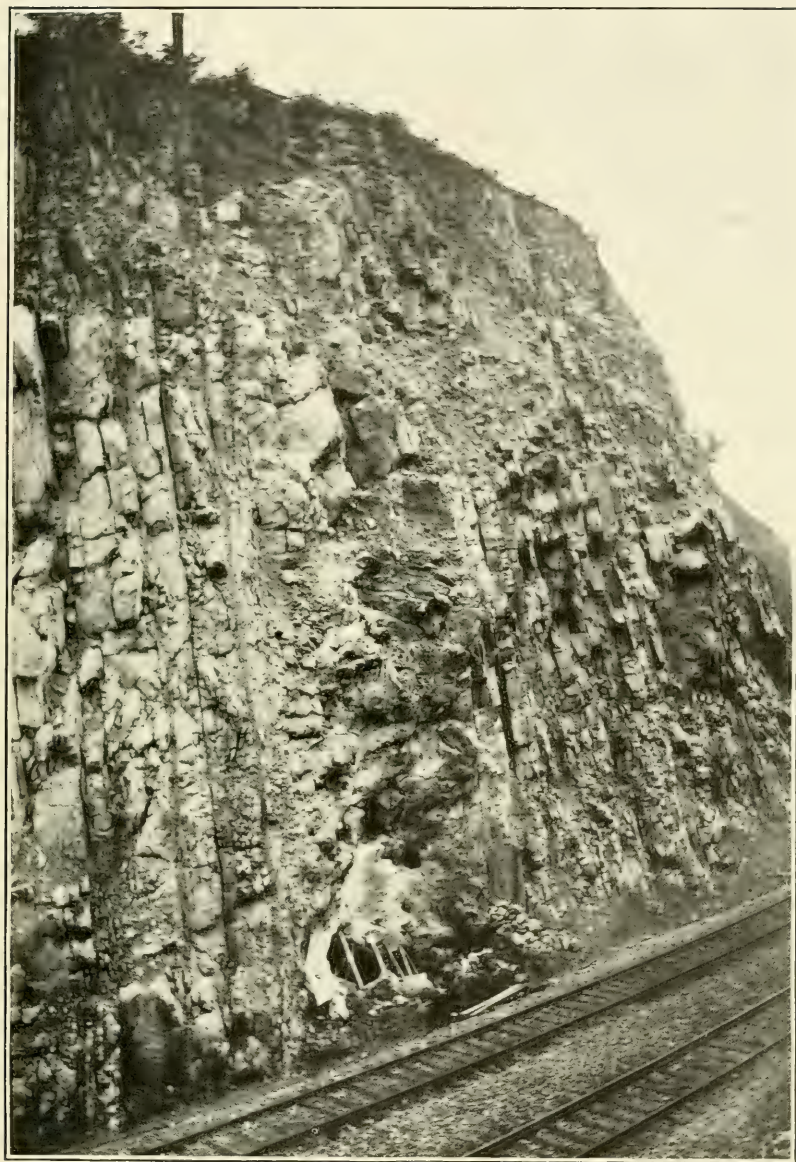


FIG. 19.—View from opposite side of railroad cut showing fossil deposits at bottom, near track, and traces of ancient opening at top of cliff. Photograph by Armbruster.

These species are all new and, with the exception of the American eland, the dog, and one of the bears, which Mr. Gidley has already described,¹ have not yet been named.

Other species represented by more fragmentary material include the mastodon, tapir, horse, and beaver, besides several species of the smaller rodents, shrews, bats, and others.

This strange assemblage of fossil remains occurs hopelessly intermingled and comparatively thickly scattered through a more or less unevenly hardened mass of cave clays and breccias, which completely filled one or more small chambers of a limestone cave, the material together with the bones evidently having come to their final resting place through an ancient opening at the surface a hundred feet or more above their present location. The deposit is at present exposed at the bottom of a deep cut through which the Western Maryland Railroad has built its tracks. The railroad excavation first brought to light the ancient bone deposit and incidentally made access to the fossils comparatively easy. It is proposed to continue work on this important deposit during the next season.

A FOSSIL HUNTING EXPEDITION IN MONTANA

While engaged in Geological Survey work in northwestern Montana in 1912, Mr. Eugene Stebinger discovered a promising locality of vertebrate fossil remains. The following summer (1913), under the auspices of the U. S. Geological Survey, Mr. Charles W. Gilmore, assistant curator of fossil reptiles in the National Museum, headed an expedition for the purpose of obtaining, if possible, a representative collection from this area.

In July a camp was established on Milk River, some thirty-five miles north and west of Cut Bank, Montana, on the Blackfeet Indian Reservation. Four weeks were spent here in collecting, the work being confined entirely to the Upper Cretaceous (Belly River beds) as exposed in the bad-lands for ten miles along this stream. Later, in August, camp was moved some fifty miles south on the Two Medicine River, and two weeks were spent working in the same geological formation.

Taking into consideration the short time at the disposal of the party, the results of the expedition were most gratifying. Between

¹ Smithsonian Misc. Coll., Vol. 60, No. 27, 1913.

Proceedings U. S. National Museum, Vol. 49, No. 2014, 1913.

500 and 600 separate fossil bones were obtained, many of them of large size. The most notable discovery was a new Ceratopsian¹ or horned dinosaur, the smallest of its kind known. There were portions of five individuals of this animal recovered, representing nearly all parts of the skeleton, so that it will be possible to mount a composite skeleton for exhibition. In this connection, it is perhaps of interest to know that, although Ceratopsian fossils were first dis-



FIG. 20.—Fossil beds as exposed on Milk River, Montana. The small Ceratopsian dinosaur was found in the breaks in the foreground. Photograph by Gilmore.

covered in the Rocky Mountain region in 1855, and portions of a hundred or more skeletons have been collected, this is the first individual to be found having a complete articulated tail and hind foot. It thus contributes greatly to our knowledge of the skeletal anatomy of this interesting group of extinct reptiles.

Another noteworthy find was a partial skeleton of one of the Trachodont or duck-billed dinosaurs. This animal was only recently

¹ Mr. Gilmore's description of this extinct reptile is to be found in the Smithsonian Misc. Coll., Vol. 63, No. 3, 1914.

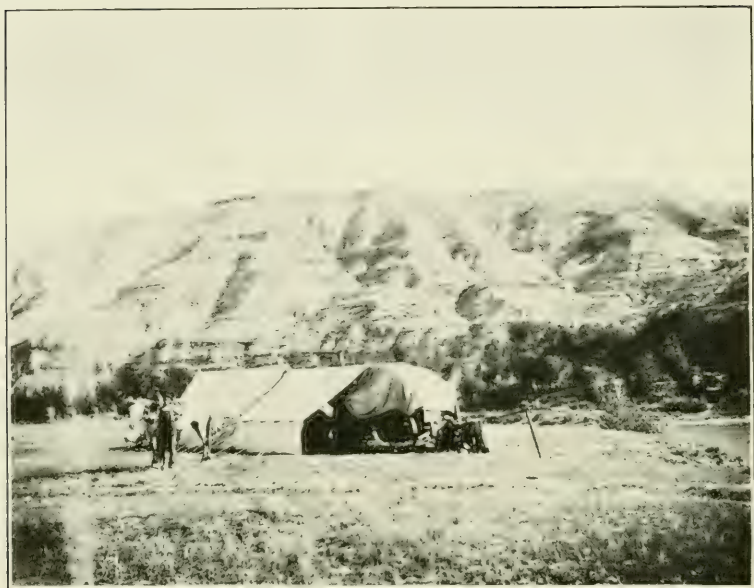


FIG. 21.—Fossil beds as exposed on Two Medicine River, Montana. Camp of fossil hunters in the foreground. Photograph by Gilmore.



FIG. 22.—Fossil leg bone of a dinosaur shown as found in the ground, on Milk River, Montana. Photograph by Stebinger.

described from specimens obtained in Canada, and its discovery in Montana greatly extends its known geographical and geological range. The species was not before represented in the National Museum collections.

Less perfect skeletons of carnivorous and armored dinosaurs, turtles, crocodiles, and ganoid fishes were also obtained. Altogether the material is a most welcome addition to the fossil vertebrate collection in the National Museum, which has been deficient in representatives of this highly interesting but little known fauna.

LIFE ZONES IN THE ALPS

During the summer of 1904, Messrs. G. S. Miller, Jr. and Leonhard Stejneger, of the National Museum, visited the Western Alps in an endeavor to ascertain the limits of the life zones which, in that part of Europe, might correspond to those of North America established chiefly through the efforts of the U. S. Biological Survey. That a system of such life zones exists in Europe has long been more or less vaguely stated by authors, but although a definite correlation was established by the gentlemen mentioned, certain points, especially the interrelation of the zones corresponding to the so-called Canadian and Hudsonian life zones in America, were greatly obscured by the long continued interference of man and animals with Nature, such as the grazing of cattle in the high Alps, deforestation, and, more recently, artificial reforestation.

It was thought that the eastern Alps might show more primitive conditions, and in the spring of 1913, Mr. Stejneger took advantage of an opportunity to visit the mountain region between Switzerland and the head of the Adriatic, through a small grant from the Smithsonian Institution. Unseasonable and rainy weather interfered greatly with the carrying out of his investigation. He arrived in the town of Bassano at the foot of the Venetian Alps on April 20, 1913, it being his plan to study the life zones of the Val Sugana and the plateau of the Sette Comuni from that point. This plateau descends abruptly to the Venetian plain on the south, while to the east and north it is separated from the mass of the Eastern Alps by the Val Sugana, or the valley of the river Brenta, and on the west by the lower part of the valley of the Adige, or Etsch. It is intersected by the boundary line between Italy and Austrian Tirol.

From April 21 to May 6, he made a series of excursions from Bassano, Levico, and Trento as successive headquarters, during



FIG. 23.—Mouth of Val Frenzela, at Valstagna, northern Italy.
Photograph by Stejneger.



FIG. 24.—Plateau of the Sette Comuni, northern Italy, looking east from Gallio. Monte Grappa in the background. The valley is the beginning of Val Frenzela. Photograph by Stejneger.

which time he completely circled the territory, and crossed the plateau once on foot. In spite of the backwardness of the season, he was able to trace the boundaries of the Austral life zones in considerable detail, as well as to gather data which connect with the previous correlation of these zones in the Western Alps and with the corresponding zones in North America. It was found that the bottom of the entire Val Sugana belongs to the Upper Austral zone. Owing to the rainy and inclement weather the results were less satisfactory in the higher regions, though some important data corroborating previous conclusions were obtained.

The time from May 7 to May 20 was spent in a study of the Etsch Valley in Tirol, from Trento to Schlanders, and of its tributary, the Eisak, from Bozen to its source on the Brenner Pass.

The elaboration of the detailed observations will be incorporated with a general report on the biological reconnoissance of the Western Alps.

To this preliminary statement are appended two illustrations showing the character of the country in which the observations were made. Figure 23 is a view of the mouth of Val Frenzela, the narrow valley through which the descent from the Sette Comuni was effected, near Valstagna, a small town a few miles north of Bassano. Figure 24 represents the plateau near the commune of Gallio, about 3,500 feet above the sea, looking east toward Monte Grappa and showing the beginning of Val Frenzela.

DR. ABBOTT'S EXPEDITION IN DUTCH EAST BORNEO AND CASHMERE

In continuation of the exploring and collecting carried on through the generosity of Dr. W. L. Abbott, by Mr. H. C. Raven, in Dutch East Borneo, it may be said that the work is going forward with excellent results.

Dr. W. L. Abbott is continuing his personal explorations in Cashmere, which he undertook a year ago, and, although the Museum has received no detailed report, some fine specimens of mammals have been added to the collections and many more are expected.

In a letter received in January, 1913, Dr. Abbott says that in his last shipment the only really good specimen is a queer little silvery grey shrew about 74 millimeters long, quite different from anything he has before seen, of which there are four specimens from Skoro Loomba, east of Shigar. There is also a magnificent snow leopard with its complete skeleton.



FIG. 25.—View from Leh, looking toward the Khardery Pass up the valley to the right. Observe the cultivation in terraces, all irrigated. The elevation is 11,200 feet. The hills in the background are from 20,000 to 21,000 feet elevation. Photograph from Abbott.



FIG. 26.—Shepherds with load-carrying sheep. Each animal carries from 12 to 30 pounds. They bring salt from Tibet to Ladak and carry back grain. Photograph from Abbott.

During the three months' trip which Dr. Abbott spent in Baltistan, in northwestern Cashmere, he secured about 289 skins which have been presented to the National Museum.

After a sojourn in England, he expected to return to Cashmere in May, and march to Ladak. He also intended to visit Nubra, and go east along the frontier to the Dipsang Plains where he hoped to secure specimens of a certain vole from Kara Korum Pass, as well as the little Tibetan fox, known to the Cashmere furriers as the "King Fox." At the time of the letter he anticipated a four months' trip during the summer of 1913.

This expedition, the results of which have been delayed in transit, was very successful. The small fox was obtained, also several wolves, lynxes, and many smaller mammals. The accompanying illustrations have been made from photographs sent by Dr. Abbott.

MARINE INVERTEBRATES FROM THE "EASTERN SHORE," VA.

In July, 1913, Mr. John B. Henderson, Jr., a regent of the Smithsonian Institution, and Dr. Paul Bartsch, of the National Museum, made a short trip to Chincoteague, on the Atlantic shore of Accomac County, Va., for the purpose of securing exhibition material of marine invertebrates and ascertaining the local marine fauna, particularly that of the mollusca. Owing to the inaccessibility of this strip of coast, generally known as the "Eastern Shore," collectors seem to have neglected it. At any event, there appear to be but few records and no critical lists published of the shallow water shells from any locality between Cape May, N. J., and Beaufort, N. C.

The chief objects of this trip were to determine of just what elements the molluscan fauna consisted; to see how many, if any, species of southern range lapped over from Hatteras, and what northern species still persisted in this faunal area. The collectors were fortunate in their somewhat haphazard choice of a locality, for they encountered at Chincoteague a greater variety of stations than can probably be found at any other point along this section of the coast.

Here there are interior sounds of very considerable extent which are very shallow (4 to 12 ft.), more or less thickly sown with oyster beds and with patches of eel grass, the bottom ranging from hard sand, through varying degrees of hard clay, to soft mud.

They found also the unusual feature of a bight or protected cove formed by the southward drift at the southern end of Assateague Island, protected from heavy wave action by a long, curved sand spit. This bight has a soft mud bottom, with a temperature possibly

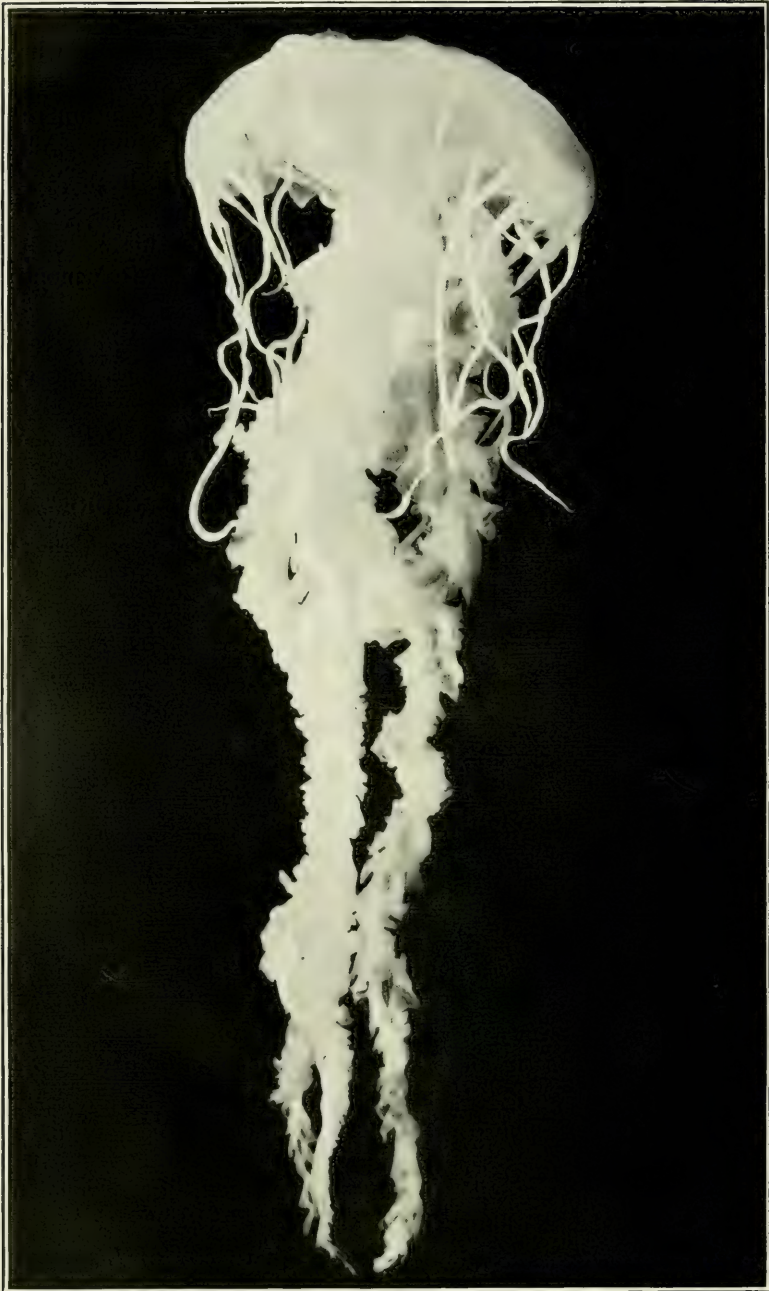


FIG. 27.—Medusa from Chincoteague, Virginia. Collected by Mr. Henderson and Dr. Bartsch. Photographed in alcohol by National Museum.

eight degrees less than that of the open sea. The mud brought up with the dredge seemed almost icy to the touch. This condition is probably produced by cold springs seeping through the floor of the bight. This colder water of the bight yielded to their dredge *Yoldia limatula*, large and fine, and *Nucula proxima*, whereas just around the protective spit of sand, on the ocean side, they found dead *Terebras* of two species, some young *Busycon perversa* and a valve of *Cardium robustum*; a somewhat startling association of species.

Then there was the open sea, which here presumably differs in no manner from other open sea stations along the 200 miles or more of this coast. The bottom drops off very gradually to the edge of the continental shelf, some 75 or 100 miles out. The open sea stations which they occupied were, as might be expected, very poor. The smooth, hard sand bottom seemed almost barren of life, and the softer patches that were explored contained only many dead shells, mostly small bivalves. The work in the open sea was scarcely a good test, although the collectors made probably 20 hauls reaching out from the shore some 4 or 5 miles, but the chart soundings indicated more promising areas of pebbly bottom a few miles beyond what they considered the safety zone for a small motor boat.

The inner waters of the sound were found to be unexpectedly rich in molluscan life, the species, for the most part, not having been taken previously outside or in the bight.

Only two full working days were spent here, where the party was fortunate in securing an excellent boat and obliging skipper. The material has been identified with great care, and the results of the expedition will be published in the Proceedings of the U. S. National Museum.

EXPERIMENTS WITH CERIONS IN THE FLORIDA KEYS

In the second issue of the Smithsonian exploration pamphlet,¹ attention was called to experiments with Cerions, conducted by Dr. Bartsch, under the auspices of the Carnegie Institution. The plantings of Bahama Cerions made upon the Florida Keys were visited in the latter part of April and early June by Dr. Bartsch, and a de-

¹ Smithsonian Misc. Coll., Vol. 60, No. 30, 1913, pp. 58-62.

tailed report of his findings is published in the annual report of the Director of the Department of Marine Biology of the Carnegie Institution of Washington (Carnegie Year Book, 1913, pp. 217-219). The results of these experiments so far obtained may be summed up as follows:



FIG. 28.—“Peanut” shells on living vegetation, Key West, Florida.
Photograph by Bartsch.

After looking over the entire plantings, Dr. Bartsch is inclined to believe that, with the exception of the Tea Table and Indian Keys, the colonies are doing as well as might be expected. It is also quite possible that when the young in the various colonies attain a larger size, a good many more will be found in the various places, in fact,

a good many may be present in places where they were not discovered previously, for the nepionic shells are quite small and hard to find.

Judging from the young collected, which were born on these Keys, the first generation will be like the parent generation unless decided



FIG. 29.—" Peanut " shells on living vegetation, Key West, Florida.
Photograph by Bartsch.

changes should take place in the later whorls, which have not as yet been developed. The largest specimens found have only seven post-nuclear whorls, leaving two to three whorls still to be developed, and these make up fully half of the length of the shell. If the present



FIG. 30.—“Peanut” shells on dead stump, Key West, Florida.
Photograph by Bartsch.

tendencies prevail in the adult shell, then it can be seen that the somaplasm has not at once responded to the change of environment. The reaction of the germ-plasm to the changed environment will await interpretation until the next generation presents itself.

Dr. Bartsch likewise kept a record of the birds seen on the various Keys visited between Miami, Florida, and the Tortugas, and has published this also in the Carnegie Year Book for 1913, pp. 220-222, with the hope that it may prove useful to students of bird migration.



FIG. 31.—Detail view of "Peanut" shells on dead stump, Key West, Florida. Photograph by Bartsch.

BIRD STUDIES IN ILLINOIS

Mr. Robert Ridgway, curator of the division of birds, U. S. National Museum, has been working on the completion of National Museum Bulletin No. 50, *Birds of North and Middle America*, and has done some exploration work in the field in connection with this work.

Recently he made a trip to the Little Wabash River, about 16 miles southwest of Olney, Illinois, in order to ascertain what species of birds were wintering in the dense thickets of the bottom lands, and to obtain evidence as to the presence there of a decided element of the Austroriparian or Lower Austral fauna and flora.

Mr. Ridgway's residence in this locality during the winter has been of extreme interest; it is the first time he has had an opportunity to make natural history observations since his first trip to this region forty-seven years ago. He was thus enabled to compare present conditions with those existing on the occasion of his first visit, and has secured some valuable information for incorporation in his exhaustive monograph.

FISHES FROM THE REGION OF QUATERNARY LAKE
LAHONTAN

The Museum has received through the Bureau of Fisheries a collection of fishes from the various river and lake basins that were



FIG. 32.—A breakfast catch of Tahoe Trout.
Photograph by Snyder.

at one time connected with the quaternary Lake Lahontan. Twenty-one species are represented, 15 of which are native fishes, including not only all that are now known to inhabit the basin, but also 5 that are as yet undescribed. The collection was made by John O. Snyder, of Stanford University, while engaged in an investigation of the region under the direction of the Bureau of Fisheries.

Lake Lahontan, which in quaternary time was a large body of water, very irregular in shape, extended over a considerable part of



FIG. 33.—Mountain meadow in the high Sierra, one of the sources of the Truckee River. Photograph by Snyder.



FIG. 34.—Truckee River, outlet of Lake Tahoe, California. Photograph by Snyder.

the region now included in northern Nevada and eastern California. It was no doubt a magnificent lake, including as it did a number of large and beautiful islands, with the great snow-capped wall of the Sierra on one side and the endless shimmering desert on the other. Even now, though dwindled and shrunken through desiccation, its glory has not all departed. For although one may travel for days over the wind-driven sands of its parched floor, the great terraces and castellated crags of its ancient shores tower at times hundreds of feet on either side, and there still remain a number of small though



FIG. 35.—Humboldt River near the Palisades, Nevada.
Photograph by Snyder.

very beautiful lakes and several rivers of considerable size which were once tributaries of the greater lake. The waters of none of these reach the ocean but ultimately disappear through evaporation, or sink into the loose, dry sands of the desert.

Lake Tahoe, near the crest of the Sierras, 6,247 feet above the sea, has 195 square miles of clear water which reaches a depth of 1,645 feet. Its outlet, the Truckee River, plunges down 2,300 feet in a distance of about 100 miles, finally bifurcating and entering Pyramid and Winnemucca Lakes. The former is 30 miles long and 12 wide, the water having a depth of over 350 feet. It embraces some pictur-

esque islands, two of which should be permanently reserved by the Government, for they shelter thousands of birds during the nesting



FIG. 36.—The Needles, Pyramid Lake. Photograph by Paine.



FIG. 37.—Tufa domes, Pyramid Lake. Photograph by Paine.

season. Humboldt, Quinn, Walker, and Carson Rivers, and also Honey, Walker, and Carson Lakes are parts of this system.

These rivers and lakes are well supplied with fishes, exceedingly abundant in number, although representing but a few species. Of chief interest and value among these are the trout which appear to have found here the most advantageous conditions for growth and development. At least 2 native species occur, *Salmo henshawii*, the large cut-throat which occasionally reaches a weight of over 20 lbs., and *S. regalis*, the royal silver trout, much smaller than the former, but a most beautiful fish, remarkable for the brilliant silver of its sides and the unparalleled blue of its dorsal surface. Formerly the lakes and rivers of the region fairly swarmed with trout, and during the spawning season they often entered the rivers in such numbers that it was difficult for them to find room in the channels. Several species of suckers and large minnows occur in countless numbers.



FIG. 38.—Bird Island, Pyramid Lake. Photograph by Paine.

Of these *Chasmistes cujus*, the Kouiewee of the Piute Indians, inhabits only Pyramid and Winnemucca Lakes. It lives in their depths, and is never seen until in the spring, when great schools suddenly appear at the mouth of the Truckee River, crowd up the channel and cover the bars, often pushing each other out of the water in their struggles to find room enough to deposit their eggs. Formerly this was an occasion of rejoicing among the Indians, for here were numbers of large, fat fishes which only need be kicked out of the water and hung on the bushes to dry. The Piutes still continue to cure them in large quantities for winter food. A small white fish abounds in favorable places. Some of the minnows reach a foot in length, bite

a fly or small spoon, and occasionally contribute to the camper's breakfast.

A study of the fish fauna of the basin bears out the conclusions of geologists regarding its long isolation. Nearly all of the species are distinct from those of neighboring systems, and some belong to groups of very restricted distribution. An account of the fishes, their habits and distribution will appear in a future bulletin of the Bureau of Fisheries.

CACTUSES AND DESERT PLANTS FROM THE WEST INDIES AND SOUTHWESTERN UNITED STATES

Dr. J. N. Rose, associate in botany, U. S. National Museum (at present connected with the Carnegie Institution of Washington



FIG. 30.—St. John's Harbour, British West Indies. The high point on the right is Rat Island, used as the Government Leper Asylum. Part of the town of St. John's is shown, the seat of government of the Leeward Islands under British control. Photograph by Russell.

in the preparation of a monograph of the Cactaceae of America), accompanied by Messrs. William R. Fitch and Paul G. Russell, spent over ten weeks in travel and field-work in the West Indies in the spring of 1913. As this was an unusual opportunity to obtain very valuable material needed for the collections of the National Museum and for use in making exchanges, the Museum detailed Mr. Russell

for the trip. This expedition formed a part of the larger scheme of studying in the field the desert plants of both North and South America, which had been organized by Dr. N. L. Britton, Director of the New York Botanical Garden, and Doctor Rose, in connection



FIG. 40.—A *Cereus* (*C. lepidotus* Salm-Dyck) common on these islands. Near St. John's, Antigua. Photograph by Russell.

with their Cactus Investigation for the Carnegie Institution of Washington. Doctor Britton also took a party to the West Indies.

Both parties started from New York City January 25. Doctor Britton and his assistants explored St. Thomas, St. Jan and others of the Virgin Islands, Porto Rico, and Curacao. His collection consisted of more than 3,000 species, comprising two sets, one of which has been sent to the National Museum as an exchange.



FIG. 41.—A specimen of the Century plant (*Agave obducta* Trelease) showing an immature flowering stalk. Near English Harbour, Antigua. Photograph by Russell.



FIG. 42.—Specimens of the Melon-cactus (*Cactus intortus* Mill.) and Century plant (*Agave obducta* Trelease) on promontory near English Harbour, Antigua. English Harbour was once a fortified British stronghold. Admiral Nelson here fitted up part of his fleet for the Battle of Trafalgar. Photograph by Russell.

At the same time, Doctor Rose's party visited St. Thomas, St. Croix, St. Kitts, Antigua, and Santo Domingo. Knowing that the Museum greatly needed duplicates for exchange purposes, general collecting was done whenever possible. Dr. Rose's collection consisted of more than 1,200 species and about 7,000 specimens. Of these, one set has been mounted for the Museum and has become a part of the study series of the herbarium. A second set was sent to the New York Botanical Garden, while other sets have been sent to the Bureau of Science at Manila, and to the Royal Botanical Garden and Museum at Berlin, for use by Dr. I. Urban in the preparation of his Flora of Santo Domingo.

While especial attention was given to collecting the Cactus flora, a large general botanical collection was made. In this there are some new species, one in particular being a very remarkable *Annona* from the desert plain at Azua, Santo Domingo.

In addition to the herbarium material, 12 boxes and crates of living plants, chiefly Cacti, were sent from the West Indies by Doctor Rose, and two boxes of living plants were sent to Lady Katharine A. Hanbury's garden at La Mortola, Italy, in exchange for specimens and courtesies shown to Doctor Rose when in Europe in 1912.

Many packages of seeds, bulbs, cuttings, etc., were obtained for exchange purposes of the Museum or for study by the various workers in the U. S. Department of Agriculture.

PLANTS FROM SOUTHWESTERN UNITED STATES

In September and October, Doctor Rose, accompanied by Wm. R. Fitch, made extensive botanical collections in southeastern Colorado, New Mexico, and western and southern Texas. While the trip was made primarily for the purpose of collecting and studying the Cacti of this region, many other flowering plants were obtained, a full set of which has been mounted and placed in the National Herbarium.

THE FLORA OF WESTERN NORTH CAROLINA

During the latter part of August and early September, 1913, Mr. Paul C. Standley, of the Division of Plants, U. S. National Museum, and Mr. H. C. Bollman, of the Smithsonian Institution, spent four weeks camping in the mountains of western North Carolina, near Montreat, Buncombe County. Although undertaken primarily as a vacation trip, advantage was taken of the opportunity for study of the flora of this most interesting region. Over seven hundred speci-

mens of plants were secured, besides small lots of some of the common and easily collected animals. Special attention was devoted to the mosses, hepatics, and lichens, in which the region abounds, and a representative collection of each of these groups was secured. Lists of the species of cryptogams have been prepared for publication.



FIG. 43.—Mountain brook near Montreat, North Carolina. Photograph by Standley.

The mountains of North Carolina are of great interest botanically, since they support a varied flora, many of whose components are not found elsewhere. Western North Carolina was visited by some of the earliest American botanists who collected here the types of many of the typically mountain plants. Although numerous botanists have explored the region, many of its divisions are still unexplored and yield rich returns to the collector.

About Montreat the mountains are covered with an almost virgin chestnut forest, traversed by numerous small, swift streams of clear, cold water, bordered with hemlocks. There is an abundant undergrowth of rhododendron and laurel, two of the handsomest of North American shrubs, which attain their greatest perfection in the southern Appalachians. The herbaceous vegetation consists of many

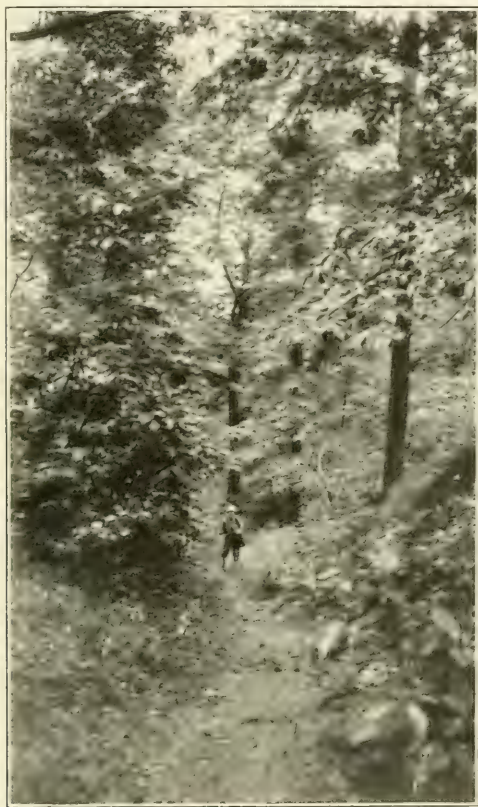


FIG. 44.—Chestnut forest near Montreat, North Carolina. Photograph by Standley.

species, some of them of limited distribution. A small sphagnum bog, in particular, yielded a large number of rare plants.

The most interesting excursion made during the month's camp was to the summit of Mount Mitchell, the highest peak in eastern North America—6,710 feet. By trail, it is distant about sixteen miles from Montreat. The trail at first follows a logging railroad which is being extended into the mountains, then strikes through the heavy

spruce and balsam forest covering the higher slopes. This primeval forest, which resembles in its general appearance those of the Rocky Mountains, unfortunately seems destined to disappear in the near future; indeed, it has already been removed from a large area, and desolation left in its stead. It is deeply to be regretted that as Mount Mitchell is made more accessible by the railroad its chief beauty will be destroyed.

A single night was spent on the summit of the mountain. A cabin was built here and maintained by the State some years ago, but it is now abandoned and has fallen into decay. At the summit of Mount

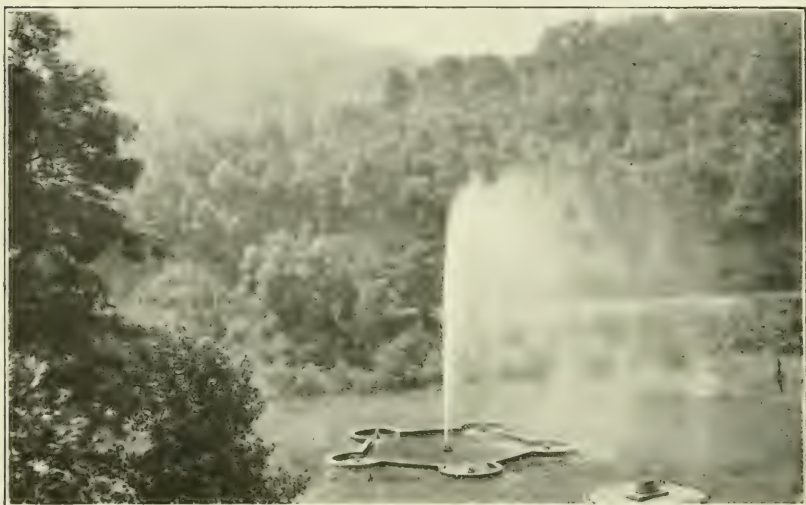


FIG. 45.—Artificial fountain near Black Mountain, North Carolina. It is fed from a reservoir on a neighboring mountain. Photograph by Standley.

Mitchell is a monument which marks the grave of the man whose name it bears, who lost his life while engaged in exploring its slopes. From this point at sunrise a wonderful view is obtained of the vast mass of mountains which cover the adjacent region, their valleys filled with a sea of clouds above which the higher peaks rise like rugged islands.

A small collection of plants was made upon the peak, a locality whose flora is little known. The flora, strangely enough, is not particularly interesting, for it includes but few species. The vegetation is remarkable chiefly for the large number of introduced plants it includes. These have doubtless been transported by the visitors who ascend the mountain each year. In spite of the altitude of Mount

Mitchell, it yields none of the boreal plants which make the floras of the mountains of New England so interesting. The lower mountains of North Carolina, and some of the other high peaks, are much more interesting botanically than this, the loftiest of them all.

ANCIENT MICA MINES OF NORTH CAROLINA

In April, 1913, W. H. Holmes, head curator of the department of anthropology, visited the mica mines of western North Carolina, making such observations as seemed necessary for a reasonable comprehension of the nature and extent of the ancient operations.

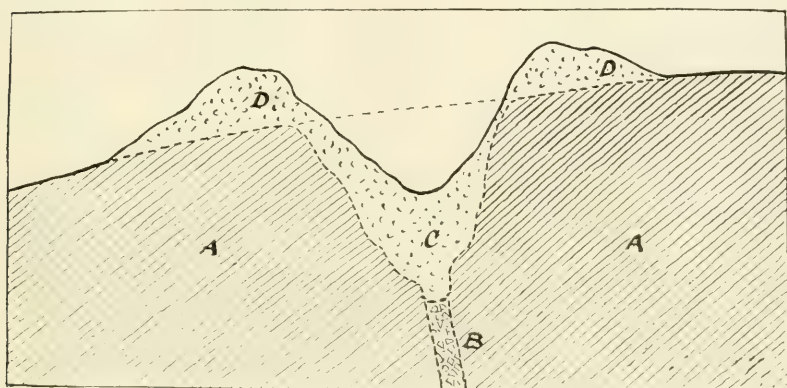


FIG. 46.—Section of an aboriginal mica mine: *A*, General schistose formation; *B*, Mica-bearing vein; *C*, Old digging partly filled up; *D*, Ancient dumps.

Mica was in very general use among the Indian tribes east of the Great Plains and was mined by them at many points in the Appalachian highlands from Georgia to the St. Lawrence River. From these sources it passed by trade or otherwise to remote parts of the country and is found especially in burial mounds, stone graves, and ordinary burials throughout the Mississippi Valley. The crystals of mica are of diversified shapes and sizes, reaching in some cases upwards of two feet in dimensions. They separate readily into sheets of very attractive appearance, which are transparent or translucent, displaying various silvery and amber hues. Mica crystals occur distributed through narrow veins of quartz and feldspar which extend at various angles through the inclosing schistose formations.

Although probably serving few practical purposes the sheets were highly prized by the aborigines for the manufacture of personal or-

naments and for sacrificial and mortuary purposes. It is stated on good authority also that they were used as mirrors.

Mr. Holmes visited a number of mines in the vicinity of Spruce-tree and Bandana, Yancey County, and near Bakersville in Mitchell County. The most important workings in the first mentioned locality are known as the Sink Hole mines, near Bandana. Although these mines have been operated extensively in recent years, sufficient traces of the old work remain to convey a fair notion of the nature and extent of the prehistoric mining. There are two main groups of pittings, each approximately 1,000 feet in length and 20 to 60 feet in

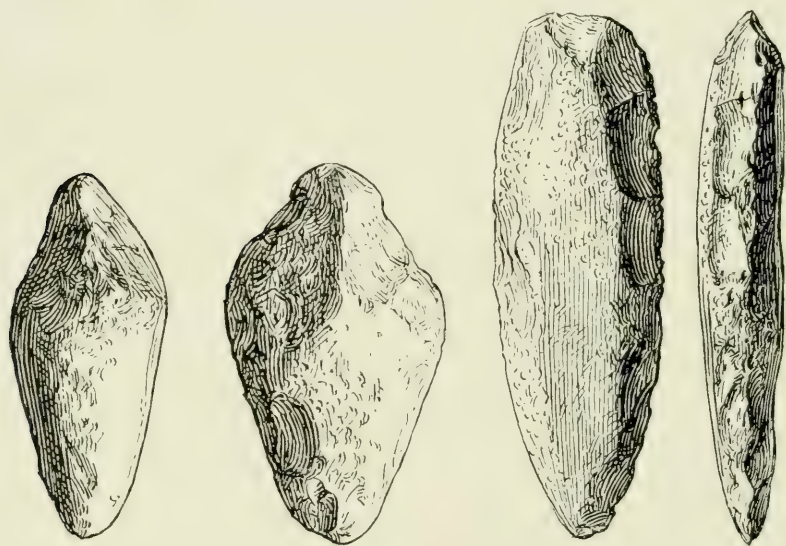


FIG. 47.—Stone picks used in excavating and freeing the crystals of Mica.

width. The original depth in many cases was upwards of 40 feet, but recent operations of white miners have served to change their appearance, and to fill up the deeper excavations. The pittings are surrounded by a somewhat uneven ridge of detritus derived from the excavations, which has been added to in places by the modern miners, and has been dug into of late years to recover the mica rejected and thrown out by the aborigines.

An important site of the ancient operations now known as the Clarissa mine, three miles east of Bakersville, Mitchell County, was also visited. This is probably the best preserved and most striking of the aboriginal workings in this general region, and serves to illustrate the importance of the mica industry in prehistoric times. Entering a

low ridge at an oblique angle, the excavation reaches a depth of nearly 100 feet. The outer margin is buried beneath heavy bodies of ancient dump material which now supports numerous chestnut trees, the trunks of which are four or five feet in diameter. The modern operators of the mine who have worked the vein at the upper end to the depth of 300 feet have filled the old trenches deserted by the aborigines.

So far as could be determined, the implements used in excavating the decomposed schists and breaking up the vein material, thus freeing the mica crystals, were rude picks and hammers of stone, a few examples of which were found. Drawings of these are shown in figure 47.

Mr. Holmes extended his reconnoissance into South Carolina, where an ancient mound of large dimensions, situated twelve miles below Columbia on the Congaree River, was examined. A plan of the mound was made, and an examination of an ancient burial site on the edge of the mound yielded numerous relics of pottery and stone.

Near Waynesboro, Georgia, a number of ancient village sites and certain outcrops of flint, where the aborigines had obtained the material for their implements, were examined. Later, in the spring, Mr. Holmes visited St. Louis, Missouri, with the view of studying the very interesting collections owned in that city, and accompanied by Mr. Gerard Fowke spent a day at Mill Creek, Illinois, making collections on the ancient quarry and shop sites of that locality. He later extended his excursion to Davenport, Madison, Milwaukee, Chicago, and Columbus, for the purpose of making studies in the museums of those cities.

ANTHROPOLOGICAL EXPLORATION IN PERU

Dr. Aleš Hrdlička, of the National Museum, has made a second report¹ concerning his field-work in Peru during the past year, in connection with the Panama-California Exposition at San Diego, for which a very important exhibit in physical anthropology is being prepared. The investigations extended over several hundred miles of the Peruvian coast and over hitherto unexplored regions in the western Cordilleras. The objects of this trip, which occupied the first four months of 1913, were to determine the anthropological relations

¹ Anthropological Work in Peru in 1913, with Notes on the Pathology of the Ancient Peruvians. Smithsonian Misc. Coll., Vol. 61, No. 18, 1914.

of the ancient Peruvians of the mountains with those of the coast, and to extend the investigations which Dr. Hrdlička has carried on for many years, regarding Indian and especially pre-Columbian pathology.

The expedition was a very strenuous one, but proved remarkably successful. Over 100 ancient cemeteries and many ruins, a large



FIG. 48.—The picturesque town of Huarochirí, in the western Cordillera of central Peru. Photograph by Hrdlička.

percentage of which were previously unknown to science, were examined and over 30 boxes of skulls and other material for future study were collected for the U. S. National Museum and the Museum at San Diego.

Dr. Hrdlička reports that skeletal material, which formerly abounded in Peru and is essential to scientific research, is fast disappearing, and in a few years can not be gathered without the expenditure of much time and money.

The results of the expedition will prove of unusual value to anthropology. While some of the links in the chain of evidence are still missing, it can now be said with certainty that the Peruvian coast from Chiclayo, in the north, to Yauca, in the south—a distance of over 600 miles—was peopled predominantly before the advent of the whites by one and the same physical type of Indian. These Indians were of medium height, with short and broad skulls, and



FIG. 49.--The ruins of the Incaic Temple of the Sun, at Pachacamac, Peru.
Photograph by Hrdlička.

moderately to strongly developed muscles according to the locality. The most important fact ascertained in this connection was that both the Chimu and Nasca, two of the foremost cultural groups of ancient Peru, were identical and, as regards physical characteristics, inseparable parts of this coast people.

According to their location, the people of old Peru were either fishermen or farmers. They seem to have been organized into numerous political groups, which developed smaller or greater cultural differences according to environment and other influences.



FIG. 50.—Ancient cemetery in Peru; a typical example of the waste of pottery and bones by the despoiling peons. Photograph by Hrdlička.



FIG. 51.—Cache, by the explorer, of ancient pottery left behind by vandals after despoliation of a cemetery south of Huacho, Peru.
Photograph by Hrdlička.

Some of their smaller dwellings were made of reeds, while larger structures were built of small uncut stones, sun-dried brick, or blocks of adobe. Their knowledge of weaving, pottery-making, and decoration was surprising. They wove from native cotton and llama wool, and their designs indicate changes brought about by time and other influences. The native dress consisted principally of a poncho shirt, a loin cloth, and sandals, with occasionally a simple head-gear.

The pre-Columbian Peruvians of the coast knew the uses of gold,



FIG. 52.—Indian hut and inhabitants, with a ruin-covered hill known at Llacxwa, in the rear, located in the Sierras, south-east of Nasca, Peru. Photograph by Hrdlička.

silver, and copper, and worked these metals to some extent, especially copper or "bronze" in the manufacture of weapons. Their common weapons were a metal or stone mace, a wooden club, a copper axe and knife, the sling, and in some regions the bow and arrow. Their implements were the whorl, weaving sticks, looms, cactus-spine or bone needle, bone needle-holders, sharpened sticks, copper knives and axes, hoes and fishing paraphernalia, including nets, sinkers, reed-bundle boats or balsas, and peculiar rafts which were paddled.

Throughout the whole territory along the coast the people deformed the heads of their infants by applying pressure to the fore-

head probably by means of pads and bandages, which process flattened the back of the head as well. They did not practice filing, cutting, or chipping the teeth, or other mutilations which would leave marks on the skeletons.

These natives seem to have been free from general bodily ailments before the advent of the white men; on the other hand they suffered from several peculiar local diseases affecting the hip-bone, the head, and the ear.



FIG. 53.—A party of vandals in an old cemetery on the railroad from Ancón to Huacho, Peru. Photograph by Hrdlička.

The people of the mountains possessed a good average development of the body and of the skull, and were even freer than the coast people from disease. Wounds were, however, common, and in some of the districts serious wounds of the head were frequently followed by the operation known as trepaning, and although this was often crudely done, it was successful in many cases. This practice was probably carried on even after the coming of the Spaniards.

The results of the expedition failed to strengthen the theories of any great antiquity of man in Peru, tending rather to prove the con-

trary. Aside from the cemeteries or burial caves of the common coast or mountain people, and their archeological remains, there was no sign of human occupation of these regions. Not a trace suggesting anything older than the well-represented pre-Columbian Indian was found anywhere; and neither the coast nor the mountain population, so far as studied, can be regarded as very ancient in the regions they inhabited. No signs indicated that any group occupied any of the sites for even as long as 20 centuries; nor does it seem that any of these people developed their culture, except in some particulars, in these places.

ARCHEOLOGICAL EXPLORATIONS IN WESTERN NEW MEXICO

Mr. F. W. Hodge, ethnologist-in-charge of the Bureau of American Ethnology, in the early autumn of 1913 made a reconnoissance of



FIG. 54.—Character of masonry shown in one of the house-groups of the compound. Note the failure of the builders to "break" the joints and the consequent weakening of an otherwise excellent wall. The face of the stones is pecked to smoothness and all the stones are artificially squared. Photograph by Nusbaum.

a group of ruins on a mesa rising from the southwestern margin of the Cebollita valley, about 20 miles south of Grant, Valencia County, New Mexico, and only a few yards from the great lava flow that has spread over the valley to the westward for many miles. While no very definite information regarding the origin of this ruined pueblo



FIG. 55.—Stone outer wall of a defensive structure near the mesa rim. This wall is about 132 feet long in the clear, and is pierced only by small loop-holes. Photograph by Nusbaum.

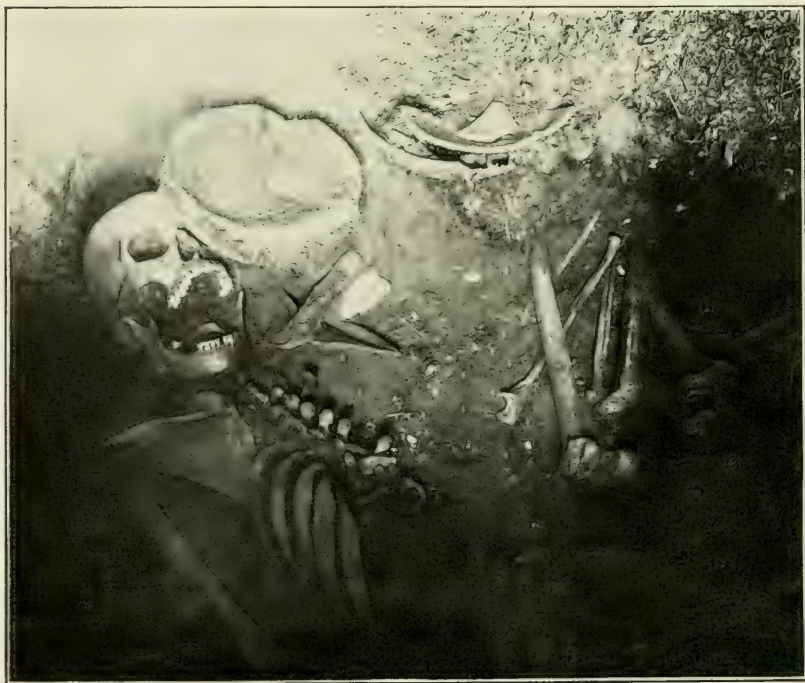


FIG. 56.—Skeleton, with burial accompaniments, found in a small cist. Photograph by Nusbaum.

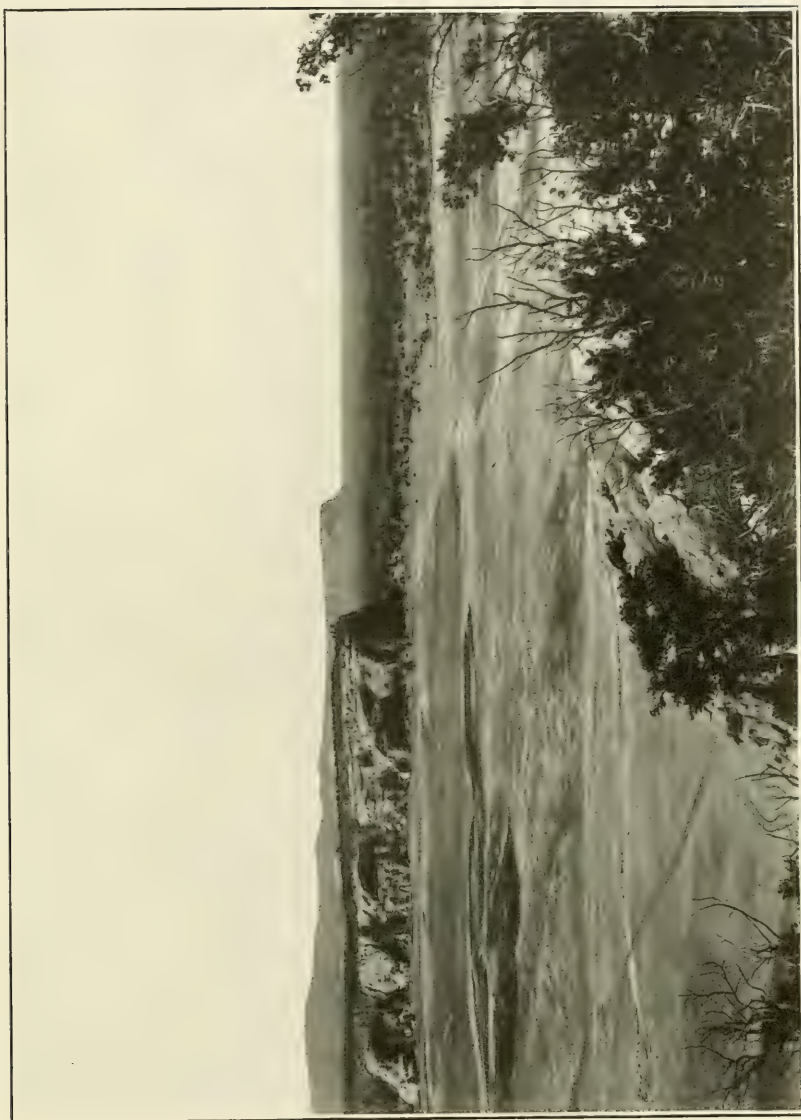


FIG. 57.—View southward across Cebolita valley, New Mexico. The lower mesa across the valley is that on the summit of which are situated the chief ruins described. Photograph by Nusbaum.

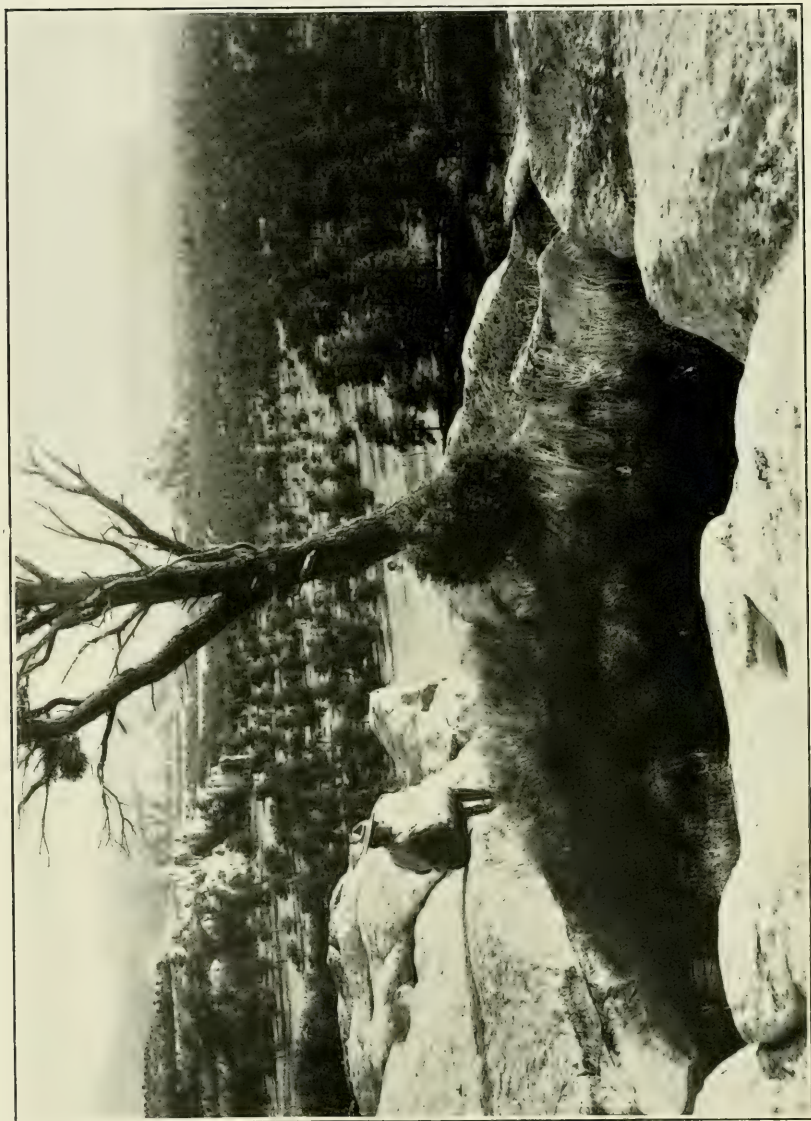


FIG. 58. —Smaller reservoir, probably chiefly a natural depression, in the rocky floor of the mesa-top; looking southward. Photograph by Nusbaum.

has yet been obtained, there is reason to suppose that it was occupied by ancestors of the Tanyí, or Calabash, clan of the Acoma tribe, and is possibly the one known to them as Kowina.

These ruins consist of a number of house-groups forming a compound, built on an almost impregnable height, and designed for de-

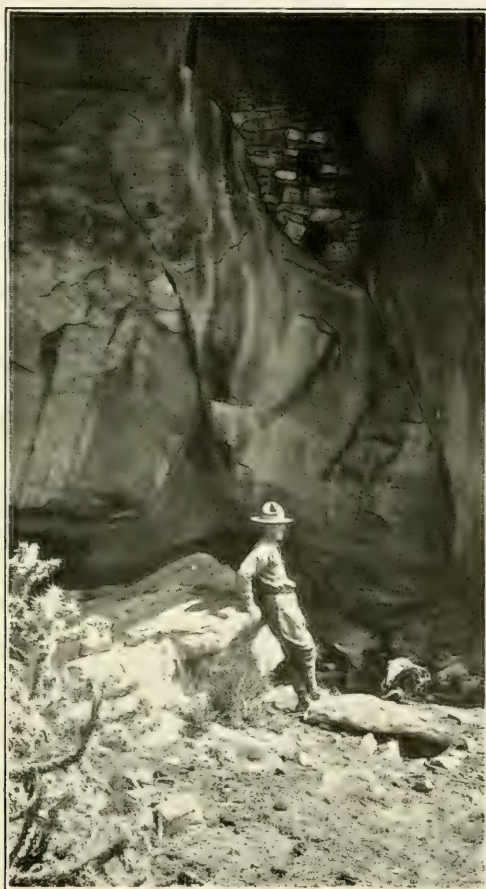


FIG. 59.—Small cliff-house on the northern side of Cebollita valley. Photograph by Nushbaum.

fence; not only the groups but the individual houses have the form of fortifications, while the vulnerable point of the mesa rim is protected by means of a rude breastwork of stones.

The outer wall, which protects the whole mesa, is built of exceptionally fine masonry, probably the finest work to be found in ancient

pueblo ruins of the Southwest. The building stones have been dressed to shape, matched for size, and their faces finished by pecking, with such labor as to confirm the belief that this ancient village was designed for permanent occupancy. Altogether the work proves of great interest, and it is suprising to note the one failing, on the part of these early builders: they seem to have been unaware of the necessity of breaking the vertical joints in the courses of masonry, thus causing many weak points in the otherwise excellent walls.

Among the special features of interest which Mr. Hodge discovered were a burial cist where skeletons, pottery, and the remains of a mat were found; three small cliff lodges situated in the sides of the cliffs; several ceremonial rooms or kivas associated with the ruined houses, and the remains of the early reservoirs of the inhabitants.

A full report on the exploration of this interesting pueblo will be made by Mr. Hodge in a later publication.

ANTIQUITIES OF THE WEST INDIES

Dr. J. Walter Fewkes, ethnologist in the Bureau of American Ethnology, spent January, February, March, and part of April, 1913, in the West Indies, studying the prehistoric antiquities of the Lesser Antilles, and gathering material for a proposed monograph on the aborigines of these islands. He examined numerous local collections, and visited many village sites, prehistoric mounds, shellheaps, and bowlders bearing incised pictographs.

The most extensive excavations during these months were made at Erin Bay, Trinidad, in a shellheap of considerable size, where he found a valuable collection of animal heads made of terra cotta and stone, and other objects illustrating the early culture of that island. From Trinidad he went to Barbados, where he found evidences of the former existence of cave people living in a shell age or one in which stone was replaced by shell. Excavations were later made at a village site of the Black Caribs at Banana Bay, Balliceaux, a small island near St. Vincent, and a small collection was gathered from it.

He obtained many drawings of specimens in a rich collection from St. Kitts and Nevis, owned by Mr. Connell, and examined the shellheaps at Salt River, Christianstadt, St. Croix, and at Indian River, Barbados. The collection of prehistoric objects obtained from St. Croix, Danish West Indies, was ample to prove that the early culture of the inhabitants of this island was more closely related to the culture

of Porto Rico than to that of St. Vincent. The material obtained in this field-work will be embodied in a report which Dr. Fewkes has in preparation on the magnificent collection of West Indian prehistoric objects owned by George G. Heye, Esq., of New York. The exploration was done in coöperation with the Heye Museum.

Field-work in the West Indian islands was supplemented by a visit to those museums in Europe where extensive Antillean collections exist. August, September, and October were devoted to studying prehistoric West Indian objects in Berlin, Bremen, Copenhagen, Vienna, and Leipzig. While in the first mentioned city he employed Mr. W. von den Steinen to make drawings of the originals of the Guesde Collection and many other objects from Hayti, Porto Rico, and the Lesser Antilles.

In the Bremen Museum a stone collar was found to have its knob modified into a reptilean head, an unique feature that would seem to shed light on the meaning of these objects. The Museum at Copenhagen has a rare ceremonial celt connecting petaloid stone axes with stone heads.

These field-studies and examinations of museum specimens have led Dr. Fewkes to the conclusion that in prehistoric times there existed in the Antilles a race of sedentary people having a form of culture extending from Trinidad to Porto Rico. This culture differed in minor details, in the various islands, as the style of stone implements, pottery, and other objects of material culture in all these islands shows. It was preceded by a life in caves which survived in western Cuba and the western peninsula of Hayti down to the time of the discovery by Columbus. The Caribs, who came comparatively late, brought a different culture that overlaid and, in a measure, absorbed the preceding culture in the Lesser Antilles. In other words, evidences were found of at least three distinct types of culture in the Lesser Antilles: cave, agricultural, and Carib. The second or agricultural type was found to have the subdivisions localized in the following groups of islands: Cuba, Santo Domingo, and Porto Rico; St. Kitts, including Nevis; the volcanic chain of islands from Guadeloupe to Grenada; Barbados; and Trinidad.

As with all other sciences, the highest form of research in culture history is comparative. It is universally conceded that the race inhabiting the New World, when discovered, had not advanced in autochthonous development beyond the neolithic age, whereas in Asia, Europe, and Africa a neolithic age was supplemented by one in which metals had replaced stone for implements. In the Old World

this polished stone epoch had been preceded by a paleolithic stone age not represented, so far as is known, in America. The ethnology and archeology of our Indians therefore form only a chapter, and that a brief one, or a segment of a much more extended racial evolution, as illustrated in Asia, Europe, and Africa.

It is profitable to compare the neolithic stone ages in the New World and the Old in order to appreciate rightly the position of the American Indian in the advance of human history, and his relation to the dawn of human history.

In order to carry on comparative studies of the stone age of aboriginal America and the corresponding age in the Old World, Dr. Fewkes spent six months in field and museum work in Europe and Africa. He visited the prehistoric mounds, dolmens, and megalithic monuments at Stendal and Stöckheim in Altmärk, a short distance from Berlin, and examined the finely installed collections from these localities in local museums. He also visited the island of Rügen, in the North Sea, where there are many prehistoric mounds, Huns' graves, workshops, and megalithic and other remains of the neolithic inhabitants. The many antiquities from this island in the museum at Stralsund furnished considerable data for a comparative study of artifacts from this part of Europe with similar objects from North America.

Dr. Fewkes believes that the time is past when the great ruins in our Southwest should be left to destruction by the elements, after smaller objects have been extracted from them. In order to protect these ruins he has inaugurated, under the direction of the Smithsonian Institution, at Casa Grande, Spruce-tree House, and Cliff Palace, a scientific method of excavation and repair. In order to improve his methods by becoming better acquainted with excavation and repair work adopted by the ablest European archeologists, he visited Egypt, Greece, and Italy (Pompeii).

He found in some cases that whereas repair work in the Old World is often neglected and cannot be called very scientific, and some of the excavated ruins have been left in very bad condition for future students, the majority are being carefully protected after excavation, in a manner well worth study by those who aspire to the most advanced standards.

The best archeological repair work in Egypt may be seen on the Temple of Amen Ra at Karnak, and the mortuary temples, the Ramesseum, Medinet-Habu, and the Seteum, from which were obtained valuable suggestions. The admirable repair of the hypo-style

hall of the Temple of Amen Ra, by M. Le Grain, is the most important ever attempted on an ancient building.

Part of his time in Egypt was devoted to comparative problems, and he was also able to give some attention, all too limited, to evidences of convergence and parallelism in the neolithic or predynastic culture of the Nile Valley with that of the Gila. He investigated more especially remarkable lines of similarity in artificial methods of water supply, in both regions, and the influence of coöperation of predynastic villages in building great irrigation canals, on the development of a higher social organization. He had always in mind the collection of material bearing on interrelationship of climatic conditions and early culture in the Nile Valley.

AMONG THE EAST CHEROKEE INDIANS OF NORTH CAROLINA

Mr. James Mooney, ethnologist in the Bureau of American Ethnology, spent the summer of 1913, June 18 to October 4, inclusive, with the East Cherokee Indians in the mountains of western North Carolina, among whom he had made his first field studies in 1887. These Indians, numbering some 1,900, live upon a small reservation in Swain and Jackson Counties with several outlying settlements farther to the west. They are a part of the historic Cherokee Nation formerly holding the whole mountain region of the southern Alleghenies until removed by military force in 1838 to the Indian Territory, where they now number about 30,000 of pure or mixed blood. Those in North Carolina are the descendants of some hundreds who made their escape from the troops and were finally, through the good offices of their friend, Col. Wm. H. Thomas, allowed to remain and settle upon lands purchased for them with their share of the fund originally appropriated for their removal to the west. There are still living among them several who remember the removal.

Constituting from the beginning the most conservative and pure-blooded element of the tribe, protected by their mountain barriers from outside influences and never having been subjected to the shock of forced removal to a distant and strange environment, these East Cherokees remain to-day the conservators of the ancient traditions, and exemplars of the aboriginal life once common in varying degree to all the tribes of the Gulf States. Until 1881, when the first school was established, they continued virtually unchanged. Since then, schools, railroads, and lumber industries have made rapid advance, which, with the passing of the older generation, must before many years bring to a close the Indian period.

On this occasion, Mr. Mooney made headquarters in the largest and most conservative settlement, locally known as Raven Town or Big Cove, some 12 miles from the agency, over a very rough mountain road impassable for vehicles during a part of the year. Here, shut in by the highest peaks east of the Mississippi, some 500 Indians dwell in fairly comfortable two-room log cabins perched high up on



FIG. 60.—Cherokee potter; Katalsta, daughter of Yanagüski, "Drowning Bear," Head chief of the East Cherokee about 1838. Photograph by Mooney.

the slopes of the mountains, always near a convenient spring. They till their fields of corn and beans, which extend sometimes even up to the crest of the ridge. Some have oxen, and a few have horses, but the great majority cultivate their fields by hand, and travel always on foot.

While many are nominally Christians, and most of the younger people can speak English, they still, as a community, adhere to their

ancient rites of the Green Corn dance, the "going to water" at every new moon, the fishing and hunting charms, the medicine man, and the native ball game. Many of the women are expert in basket making, in a variety of patterns, but the pottery art, which flourished a few years ago, is now virtually extinct. The blow-gun, formerly used for shooting small game, is now almost a thing of the past, together with the head turban and the moccasin.

Although the outer life and semblance are thus altered, the possession of a native alphabet or syllabary, invented by a mixed blood of the tribe nearly a century ago, has enabled their priests and doctors to preserve their ancient ritual prayers and formulas without change and apparently almost without diminution from the remote past. By good fortune some twenty-five years ago Mr. Mooney was enabled to obtain some hundreds of these Cherokee manuscript formulas, the secret possession of their leading priests. Many others have been obtained on later visits, in addition to much miscellaneous ethnologic material, until the collection now numbers approximately 600 formulas, perhaps the equivalent of as many printed quarto pages, covering every occasion of Indian life, war, love, hunting, fishing, agriculture, medicine, games and ceremonials. This collection of aboriginal American literature is unique and without parallel. As a revelation of primitive psychology it is invaluable. The antiquity of the formulas is sufficiently indicated by the abundance of archaic forms and references, many of which cannot now be explained even by the priests, who simply say, "This is the way it was given to us." Many of these formulas are highly poetic.

The explanation of those originally obtained, almost one-half the whole collection, was procured from the principal recognized priests of that time, all of whom are now dead. At the same time, all the words of the formulas were glossarized, and all the plants mentioned in the medical prescriptions collected, and labeled with their Indian names, and later identified botanically by experts of the Smithsonian Institution. Other formulas have been translated and explained during subsequent visits. During the last summer the number was considerably enlarged by the best known teachers. All those then untranslated were translated and glossarized, and the additional plants named therein collected. The whole body was then revised from the beginning, so that nearly every formula has now had the interpretation of at least three recognized authorities. There is still a paucity in certain classes as compared with others, notably in the formulas relating to war and to the ball play, as compared with those relating

to medicine and love. This deficiency may be supplied by future gatherings, but for the formulas already translated, it may be confidently affirmed that no important additional light is now procurable.

While the formulas constitute the largest body of aboriginal American literature extant, the plant collection constitutes probably the largest ethno-botanic collection from any one tribe, comprising some 700 species with Cherokee names and uses, nearly all of which have been scientifically identified by expert botanists. This collection represents the combined plant knowledge of the principal doctors in the tribe.

Opportunity was also afforded for special studies and observations, particularly of the ceremonial "going to water," and augury with the beads to forecast the health prospect and life-span of each member of the family, before partaking of the first corn of the new crop.

CEREMONIAL DANCES OF THE CREEKS IN OKLAHOMA

In July and August, Dr. John R. Swanton of the Bureau of Ethnology visited the territory of the old Creek Nation in Oklahoma,



FIG. 61.—The "Feather" dance, Fish Pond square ground.
Photograph by Swanton.

to attend several of the ceremonial dances or busks about which he had collected much information in previous years. He witnessed four of these ceremonials; that of the Eufaula Creeks near Eufaula, McIntosh County, those of the Hilibi and Fish Pond Creeks near Hanna, in Hughes County, and that of the Tukaba'tci near Yeager. Notes were taken on all of them and a number of photographs were obtained of the first three. Considerable supplementary information



FIG. 62.—The women's dance, Fish Pond square ground.
Photograph by Swanton.



FIG. 63.—"Feather" dance, Hilibi square ground. Photograph by Swanton.

was secured from the older men regarding the busk ceremonial and other ancient usages.

When the ceremonies were over Dr. Swanton visited the Indians in Seminole County, who still speak Hitchiti, a language formerly current throughout southern Georgia, and recorded several texts. He also secured the coöperation of a Hitchiti Indian, able to write in the missionary alphabet, to obtain other texts after his departure.

CEREMONIES AND RITUALS OF THE OSAGE

During the year 1913, Mr. Francis LaFlesche of the Bureau of American Ethnology secured the songs and rituals of five different Osage ceremonies. Two of these are practically complete; the others are fragmentary, but enough information was obtained to give a fair idea as to their significance. These rites are: *Wa-dó-ka We-ko*, Scalp Ceremony; *Wa-zhiú-ga-o*, Bird Ceremony for boys; *Wa-wa-thon*, Peace Ceremony; *Zhin-gá-zhin-ga Zha-zhe Tha-dse*, Naming of a Child; and *We-xthe-xthe*, Tattooing Ceremony.

Owing to the superstitious hold these rites still have upon the people, together with the fact that every initiated person obtained his knowledge at a great expense, it was almost impossible to procure complete texts of any of the ceremonies.

The Tattooing Ceremony is of peculiar interest. It was more difficult to secure information concerning it than of any other ceremony. In earlier times only the warrior who had won war honors was entitled to have the ceremony performed and have the war symbols tattooed upon his body. If his means permitted it, they might also be placed upon any number of his relatives. These war symbols were his marks of distinction as a man of valor, for the strength and life of the tribe depended upon the prowess of the warriors. In those days there were but few who were entitled to have the ceremony performed, because war honors were not easily won and few were wealthy enough to afford the expense of the ceremonies. When, during the last century, wars between the various tribes ceased, the real significance of the rite vanished, but the superstitious belief that the symbolic figures meant long life to the individual so tattooed, remained prominently in the minds of the people.

About the time that the right of the honored warrior to the exclusive use of the Tattooing Ceremonies came to an end, a new condition arose which materially changed the character of the rite. From the sales of lands to the United States the Osage tribe acquired a wealth by which a greater number of its members were enabled to

have performed the tattooing, as well as other ceremonies. It was then that this ancient rite became the means by which any individual could publicly display his affection toward a relative.



FIG 64.—An Osage Indian with tattooing.

Figure 64 shows designs tattooed upon the body of a man. Those on a woman are more elaborate and cover the upper part of her body, breast and back, and the lower part of her legs. Figure 65 shows

three implements used in tattooing. Each of these is made of wood about the length of a pencil. To the lower end are attached needles arranged in a straight row, and to the upper end are fastened four small rattles made of the large wing quills of the pelican. This

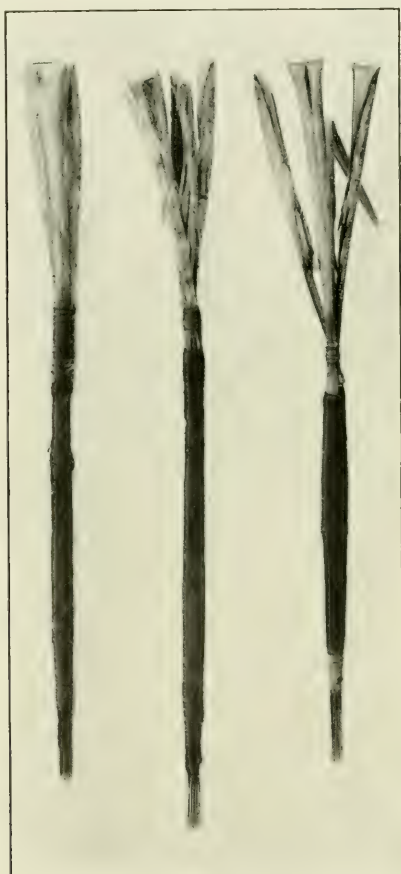


FIG. 65.—Three implements used in Osage tattooing. Photograph by DeLancey Gill.

bird is referred to in one of the dream rituals as, *Mon-thin-the-don-ts'a-ge*, He-who-becomes-very-old-while-yet-going. In certain passages of the ritual it is intimated that these implements were originally made of the wing bone of this bird and were used for doctoring as well as for tattooing.

The coloring matter employed in tattooing is made of charcoal mixed with kettle black and water. The charcoal is made from certain trees that serve as symbols of long life in the war ceremonies. Tail feathers of the pileated woodpecker are used for putting on the ink and drawing the lines.

On November 17, 1910, Wa-çé-ton-zhin-ga, one of the prominent men of the Pa-çi-u-gthin band (Hill-top Dwellers) died. It was learned that he had a Wa-xó-be-ton-ga, a Great Wa-xó-be. This is a white pelican, the bird which is supposed to have revealed, through a dream, the mysteries of tattooing and to have supplied the implements. On February 16, 1911, Wa-çé-ton-zhin-ga's widow after much persuasion reluctantly consented to part with this sacred object (the Great Wa-xó-be), together with its buffalo hair and rush mat cases. It was thus secured by the writer, and now has a place in the United States National Museum.

A STUDY OF SIOUX MUSIC

The field-work of Miss Frances Densmore during the season of 1913 was concentrated on the southern portion of the Standing Rock



FIG. 66.—Indians dancing the Grass Dance at Bull Head.
Photograph by Miss Densmore.

reservation, which lies in the State of South Dakota. Many acquaintances had been made on a previous visit to the locality, and the earlier knowledge gained of the Indians opened the way for intensive work along the lines which had been selected, *i. e.*, songs of war, songs connected with the use of medicinal herbs, and songs of tribal social

organizations. As in previous years, the songs were recorded phonographically, about 130 songs being secured in this manner for the Bureau of American Ethnology.

In connection with this work Miss Densmore collected about 120 specimens, illustrating the old arts and industries as well as the customs of war and the practice of medicine. Twenty herbs said to have medicinal properties were secured from medicine men who use them in treating the sick. These herbs were identified at the Department of Agriculture in Washington, and a number of them were found to be in use among physicians of the white race.



FIG. 67.—Indian equipment for boiling meat without a kettle. Photograph by Miss Densmore.

During the celebration of July Fourth, at Bull Head, many old dances were given. Figure 66 shows the Indians at this celebration of the Grass Dance. A demonstration of the manner of boiling meat without a kettle was also given, Miss Densmore witnessing the process and afterward purchasing the entire equipment, shown in figure 67. This was of interest in connection with the subjects under investigation, as it was a method used in old times by Indians on the war path or buffalo hunt. The paunch of a freshly killed animal was suspended between three stakes, water was placed in it, and brought to the boiling point by means of heated stones. Meat was

thoroughly cooked in this manner. A portion of the meat thus prepared was secured in connection with the apparatus.

Many of the war songs were illustrated by native drawings. Figure 68 shows a man known as Jaw, an old warrior with a wide reputation



FIG. 68.—Jaw, an old Sioux warrior, whose horse-stealing expeditions are illustrated by his own drawings in the background. Photograph by Miss Densmore.

for stealing horses. Behind him is one of his drawings depicting such an expedition.

A medicine man with his drum is shown in figure 69. This man was named White Paw Bear, and proved a valuable informant to Miss

Densmore. He was a close friend of the famous chieftain Sitting Bull.



FIG. 60.—White Paw Bear, a medicine man with his drum.
Photograph by Miss Densmore.

Miss Densmore attended a large feast given in her honor by Red Fox, the Sioux chief who adopted her two years previously in place of his daughter. This adoption was ratified later by the tribe.

STRANGE RITES OF THE TEWA INDIANS

Mrs. M. C. Stevenson continued her comparative study among the Tewa Indians of the Rio Grande valley, in behalf of the Bureau of American Ethnology. A close relationship was found to exist among all the Pueblo Indians, especially in their essential beliefs, resulting in a great brotherhood between them. Living in an arid land the cry of their souls was and is—"rains to water the earth."

Primitive man sought to define the mysteries of Nature, to account for its phenomena; thus primitive philosophy was born, and then re-



FIG. 70.—Plaza and kiva of the Sun people, San Ildefonso. X denotes the entrance to the kiva. Photograph by Mrs. Stevenson.

ligion and ritualism crept in. The Pueblo Indian began at an early period to create a pantheon of gods of his worship, gods to be appealed to for the good things of life, and angry gods to be propitiated, and thus, long ago, a most complicated system of religion and rituals developed among such peoples of the Southwest as had homes constructed of stone, clay, and plaster.

The more clever men of the past ages differentiated their gods into two classes, anthropic, principally ancestral, and zoöic, and these men assumed to dominate the remainder of the people by asserting their direct communication with the gods. Through their power and influence with these gods they were next in importance to the gods them-

selves. Their doctrines taught that: The gods who bring good are exacting, and man must comply with the demands of his gods in order that the godly blessings may be bestowed upon him. He must not only perform the religious duties assigned him, but observe proper intelligence in the performance of these rites. "In the far past Aväⁿ'nyu, the great plumed serpent, whose home is in the depths of the lake of the departed, determined to take a journey over the upper plane so that he could look below and observe the people of this world.

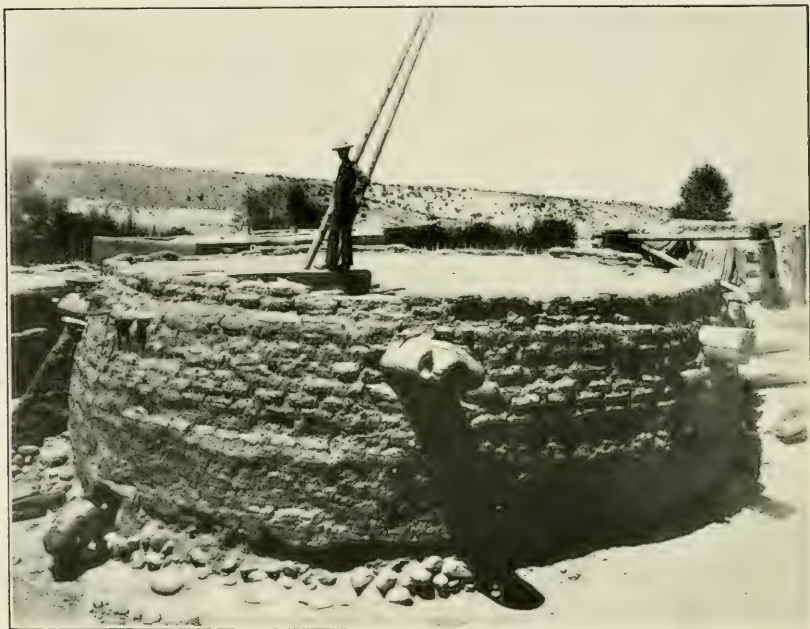


FIG. 71.—Circular kiva at Pueblo of Nambe, New Mexico.
Photograph by Vroman.

Upon viewing a certain village on the summit of a mesa not many miles from the present pueblo of San Ildefonso on the Rio Grande, he discovered that though the people were devout, their rituals were all wrong and as a punishment for their ignorance he converted them into *si'de* (small bird), Mexican pajarito, and had them fly away. Since that time the deserted village has been called Si'de ge, small bird place. These ruins are known to the outside world as the Pajarito ruins.

Religion and ritual kept pace with the development of man. The peoples more remote from the long-continued influence of Roman

Catholic priests, retain more of their elaborate rituals and native paraphernalia than those who have been under the control of the Church.



FIG. 72.—Rain priest of Sun people of Nambe. Photograph by Mrs. Stevenson.

Priesthoods and fraternities were organized, and chambers were built in which to invoke and propitiate the gods. These chambers were circular and built under ground, symbolizing the innermost world

whence the people came. As the people ascended from these chambers, they symbolized their emergence from the innermost world



FIG. 73.—Juan Gonzales, associate rain priest, and present governor of San Ildefonso. Photograph by Mrs. Stevenson.

into this world; and, although most of the kivas, or Hopi ceremonial chambers, at the present time, are above ground or partially so, they

still represent the undermost world, the coming out still symbolizing the emergence from the undermost world, and the kiva the undermost world itself. The kiva is a prominent feature of the archeological remains of the Southwest, there is seldom a mesa, cliff, or cavate ruin where these ceremonial chambers are not to be found. They are the substantial evidence of the worship of the cliff dwellers. The underground structures have undergone changes since the oppression of the invading Spaniard. In the Tewa village of San Ildefonso, for example, the under-ground circular kiva was abandoned after the first departure of the Spanish invaders; in fact, there is not a pre-Spanish building in the village. The ruins of the old village are barely distin-



FIG. 74.—Zuñi personators of the rain gods.
Photograph by Mrs. Stevenson.

guishable in the fields, while the present village stands a short distance to the north. The first kiva constructed by these people after the coming of the Spaniards was round and built principally above ground, but before another kiva was constructed the people decided to build these chambers in rectangular form and in line with their dwellings, so that they would not be distinguished by the Spanish enemy. Many other pueblos adopted the plan of the rectangular kiva situated among the dwelling houses.

The Tewa are divided into the Sun and Ice peoples, therefore there are two kivas, one for each people. Every male child must be initiated into one of the kivas in order to be eligible to dance with the gods after death in the undermost world. The female child is passed

through impressive ceremonies by a priest of the kiva, just after birth, and is carried into the presence of the rising sun on the twelfth day. As the tiny infant is held up facing the sun the following prayer is offered to the Sun father: "May the child grow to womanhood; may she speak with one tongue, be gentle and kind to all, and may all be gentle and kind to her. May her life be so full of love for all the world, and may her acts be so pure that she may be blessed with the love of the Sun father, so that her span of life may be complete, that she may not die, but live long, and become a child again,



FIG. 75.—Learning to photograph. A fine likeness of the rain priest of the Ice People. The woman at the tub is his mother. Photograph by Mrs. Stevenson.

and so sleep, not die, to awake in the world with the gods. May she ever inhale more of the sacred breath of life."

In order that the rain priest may come into closer communion with the gods he must mortify the flesh. Semi-annually, at the winter and summer solstice, the rain priests of the Sun and Ice people retire, each with his associates, into the kivas for a retreat of four days and nights, to pray for rains, observing strict fasts, taking only meal-bread, and drinking popcorn water. Here it is that the rain gods are specially invoked. The rain priests do not pray with their lips—"hearts speak to hearts." While the priests practice deceptions upon the people and even delude themselves, when they leave their retreat,

it is evident from their expressions that their minds and bodies have been elevated above worldly thoughts.

Whence come the rains so devoutly prayed for? By direction of the Council of the Gods, the shadow people fill their vases and long-necked gourd jugs from the waters of the six regions, and, ascending to the upper plane, provided there are sufficient clouds to protect the rain makers from view of the people of this world, they proceed to water such portions of the earth as have been assigned to them by the Council. The Tewa priests have given such close observation to



FIG. 76.—Kiva of the Ice People, San Ildefonso. X shows upper entrance. Two trees are by the lower entrance. This kiva is head-quarters for the buffalo ceremonial. Photograph by Mrs. Stevenson.

the winds and clouds that they are quite weatherwise, and seldom select a time for a rain dance, when rains do not follow.

Zoic worship has to do with the healing of the sick, the beast gods acting as mediators between man and the anthropic gods. The most shocking ceremony associated with the zoic worship of the Tewa is the propitiation of the rattlesnake with human sacrifice to prevent further destruction from the venomous bites of the reptile. The greatest secrecy is observed and the ceremonies are performed without the knowledge of the people except those directly associated with the rite which is performed quadrennially. Although many legends of the various Pueblos have pointed indirectly to human sacrifice in the

past, it was a revelation to Mrs. Stevenson when she found that this rite was observed by the Tewa at the present time; and, while it is known to exist only in two of the villages, she has every reason to believe that they are not exceptions. In one village the subject is the youngest female infant. In the other village an adult woman is sacrificed, a woman without husband or children being selected whenever possible. The sacrificial ceremonies occur in the kiva. The subjects are drugged with *Datura meteloides* until life is supposed to be extinct. At the proper time the body is placed upon a sand painting on the floor before the table altar and the ceremony proceeds amid incantations and the most weird performances. The infant is nude,



FIG. 77.—Lucindra Jackson, Yonkalla tribe, Kalapuya family. Photograph from Frachtenberg.

and the woman is but scantily clad. The rattlesnakes, which have been starved, are turned loose from the pottery vases and allowed to feast upon the body until not an atom of flesh remains. The skeleton is then deposited, with offerings, beneath the floor of an adjoining room of the kiva. The entire ceremony is performed with the greatest solemnity.

NOTES ON THE ALSEA AND KALAPUYAN INDIANS

The opening of the year found Dr. Leo J. Frachtenberg in Siletz, Oregon, completing the linguistic and ethnological studies that were commenced in 1910, among the Alsea Indians. In addition to im-



FIG. 78.—Mary Harris, who died in 1910, the last of the Willapas. Photograph from Frachtenberg.



FIG. 79.—William Smith, an Alsea Indian, about 65 years of age. Photograph from Frachtenberg.

portant new linguistic material, he obtained a number of myths belonging chiefly to the Coyote cycle. This work was brought to a successful close towards the end of March.

In the early part of June he went to Bay Center, Washington, where he was told could be found, still extant, some members of the Willapa tribe, an important branch of the Pacific group of the



FIG. 80.—William Hartless, a Kalapuya Indian about 65 years of age. Photograph from Frachtenberg.

Athapascan family. Unfortunately, upon close investigation, these reported Willapas proved to belong to the Chehalis tribe of the Salish family, a circumstance that substantiated his previously expressed belief that the Willapa Indians are entirely extinct. Upon his return to Siletz, Oregon, Dr. Frachtenberg began work on the Kalapuyan family, collecting linguistic notes and mythological material until the middle of September, when the work had to be discontinued for lack of funds.

FIELD-WORK AMONG THE CATAWBA, FOX, SUTAIO, AND
SAUK INDIANS

From a study of Siouan and Muskogean languages, it appeared that these stocks resemble each other morphologically as compared



FIG. 81.—The Brown Family, Catawba Indians. Photograph by Michelson.



FIG. 82.—Catawba Children. Photograph by Michelson.

with other American Indian languages. It therefore became a matter of importance that Catawba, a Siouan language of the Southeast, should be investigated to determine how close these resemblances were, and whether it was possible that both stocks were de-

rived from a common ancestor, but had differentiated at an early date. Accordingly, Dr. Truman Michelson of the Bureau of Ethnology left for South Carolina in May, 1913. Unfortunately, though a goodly number of individual words were collected, it was found that barely half a dozen persons were left who could give simple connected phrases, and only one or two who could give connected



FIG. 83.—An old Cheyenne who remembers a little of the Sutaio language. Photograph by Michelson.

texts, but upon examination it was found that even the few texts which Dr. Michelson collected were extremely fragmentary. Under these conditions it is likely that it will not be possible to unravel the structure of the language in detail, and hence the problems presented above remain unsolved.

In July, Dr. Michelson arrived in Tama, Iowa, to renew his researches among the Fox Indians. After making arrangements for

future work in August, he left for Montana to ascertain whether the Sutaio were a missing link connecting the Cheyenne with the normal Algonquian. The number of persons who remembered anything of the language were few, and none who could dictate connected texts were found. However, it seems clear from the individual words collected, that Sutaio will not shed any light on Cheyenne.



FIG. 84.—David A. Harris, Chief of the Catawba Tribe. Photograph by Michelson.

Upon his return to Iowa at the end of the month, he renewed his work with the Fox Indians. He was particularly successful in working out their social organization. A few more important myths were collected, and a number of those collected previously were translated. During his stay among the Foxes he also secured a number of ethnological specimens for the National Museum.

In October, Dr. Michelson left for Kansas to investigate the Sauk and Fox of the Missouri and adjacent tribes. A preliminary survey was all that was attempted owing to the inclemency of the weather. Some myths, obtained among the Foxes of Iowa, were also translated, and the investigator returned to Washington for office work.



FIG. 85.—A Catawba hearth with pottery. Photograph by Michelson.

EXPEDITION OF THE ASTROPHYSICAL OBSERVATORY

Mr. L. B. Aldrich proceeded to Mount Wilson in July, 1913, for the purpose of measuring the solar radiation. He was joined there at the end of August by Director Abbot. Several kinds of work were undertaken; first, the usual spectro-bolometric determination of the solar constant of radiation. This work has now been carried on during every summer at Mount Wilson from 1905 to 1913 inclusive, excepting the year 1907. It has resulted in showing an irregular variability of the sun from day to day, and a dependence of the sun's radiation on the number of sun-spots. It has also yielded a value of the solar constant of radiation believed to be correct within one per cent. Since there have been criticisms of the value, however, on the ground that it is impossible to correctly estimate the losses of radiation in the earth's atmosphere, it was felt desirable to check the result by sending up self-registering apparatus attached to free balloons to the highest possible altitudes.

This work was undertaken by Mr. Aldrich in July in coöperation with the United States Weather Bureau. Balloons were sent up on five days from Santa Catalina Island, carrying in each instance a self-registering pyrhelionometer devised and tested at the Smithsonian Astrophysical Observatory, and a self-registering apparatus of the Weather Bureau, which records the temperature, pressure, and humidity of the atmosphere.

All the balloons carrying pyrheliometers were fortunately recovered, and in one instance the flight reached the altitude of about 33,000 meters, or 108,000 feet. The registering pyrheliometers behaved very well with the exception that their temperature sunk lower than was expected, so that in each case the mercury in the stem of the

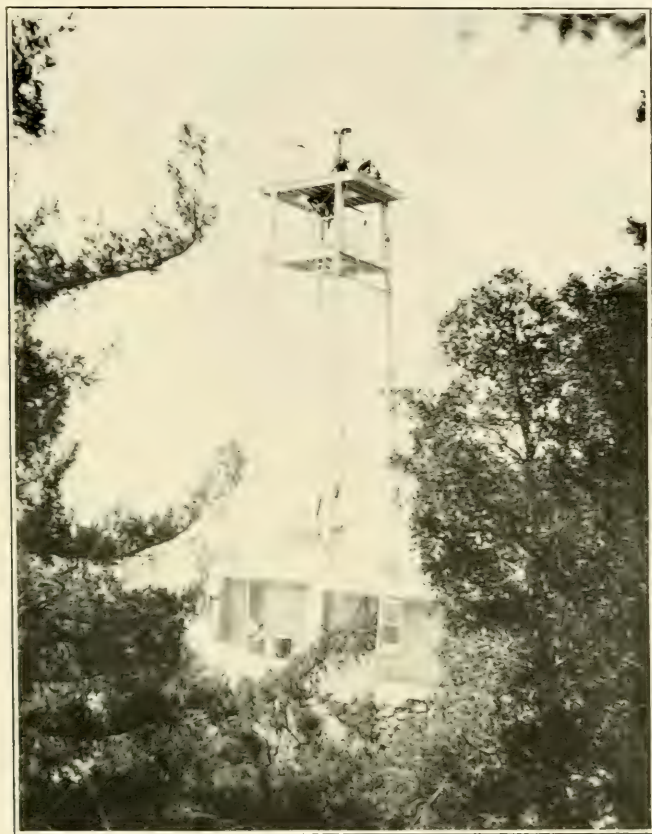


FIG. 86.—Observing station of Astrophysical Observatory on Mount Wilson with new tower telescope. Photograph by Abbott.

thermometers was frozen at an altitude of from 40 to 50 thousand feet, and therefore their records did not extend as high as the flights of the balloons. Nevertheless these measurements are obtained at altitudes above the highest clouds, and where the water-vapor and dust of the atmosphere is almost inappreciable. The results reached do not differ from what would be expected in view of the value of

the intensity of the solar radiation outside the atmosphere, as computed from the ordinary measurements of the Astrophysical Observatory. It is expected that the observations will be repeated with improved apparatus in the year 1914.

After the arrival of Mr. Abbot, the new tower telescope was completed and prepared for observations of the distribution of brightness over the sun's disk. A solar image of about 9 inches in diameter is formed in this telescope by the use of mirrors, without lenses. The distribution of brightness along the diameter of the disk is observed at different colors of light by means of the spectro-bolometer. It is found that the sun is much brighter at the center of the disk than

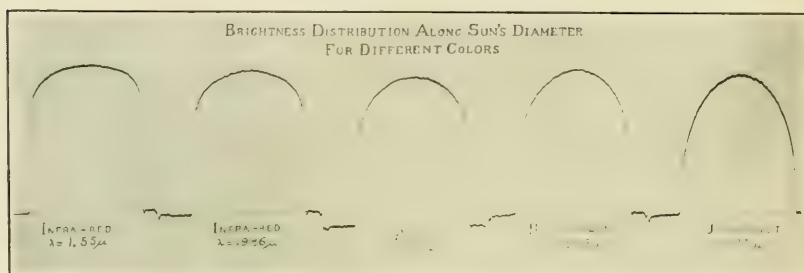


FIG. 87.—Diagram showing Brightness Distribution along Sun's Diameter.

it is near the edge, and that this contrast of brightness is greater for red light than for violet light.

The distribution of brightness along the sun's disk was observed on nearly 50 days, in connection with measurements of the intensity of the solar radiation as it would be outside the atmosphere. The results show in 1913, as in former years, a variability of the solar radiation from day to day. Along with this variability of the amount of the radiation, there is also shown a variability of the distribution of the brightness along the diameter of the sun's disk. This result is very interesting and important, for it enables the variability of the sun to be observed in two independent ways at the same observatory.



SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 66, NUMBER 3

EXPLORATIONS AND FIELD-WORK OF THE
SMITHSONIAN INSTITUTION
IN 1915



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EXPLORATIONS AND FIELD-WORK OF THE SMITHSONIAN INSTITUTION IN 1915

The Smithsonian Institution every year initiates or cooperates with other institutions in numerous expeditions to various parts of the world in the interest of theoretical and practical science. Accounts of the principal expeditions engaged in during the year 1915 are presented herein chiefly in the words of the investigators themselves, while those of more than routine importance are signed with the names of the writers. The various lines of research include geology, zoology, botany, anthropology, physics, and astrophysics.

Of the several branches of the Institution, only the United States National Museum, the Bureau of American Ethnology, and the Astrophysical Observatory are mentioned in this account as having engaged in field-work. The National Museum has no specific funds for this purpose, but whenever possible embraces opportunities to take part in natural history investigations and to add to its collections and exhibition series. Researches in American ethnology consist largely of field-work among the Indian tribes, detailed accounts of which will be found in the annual reports of the Bureau. The Astrophysical Observatory undertakes expeditions here and abroad for the purpose of observations in connection with its regular work of studying the physical properties of the sun and their effects on the earth.

The results of these explorations and field-work have been to increase scientific knowledge and to yield valuable material for the collections and study series of the National Museum and the Bureau of American Ethnology. The Institution is forced every year to forego numerous opportunities to participate in other expeditions owing to its limited means.

GEOLOGICAL EXPLORATIONS IN THE ROCKY MOUNTAINS

In continuation of previous work in the Rocky Mountain region, Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, was engaged in field investigation in the Yellowstone Park area, and from there north into the Belt Mountains east of Helena, Montana. The work in the Yellowstone Park was carried on with two objects in view:

First: To determine, if possible, the extent to which the lower forms of algæ and possibly bacteria contributed, through their activities, to the deposition from the geyser and hot-spring waters of the contained carbonate of lime and silica.



FIG. 1.—Riverside Geyser in eruption, Upper Geyser Basin. Water falls into Firehole River. Photograph by Mary Vaux Walcott.

Second: The securing for the National Museum, of a series of geyser and hot-spring deposits, also silicified wood from the petrified forests and certain types of volcanic rocks.



FIG. 2.—Camp in meadows near Apollinaris Spring, close to main road traversed by a thousand tourists daily. The bears made frequent visits, two grizzlies, two black, and one brown bear calling in an afternoon. Photograph by Walcott.



FIG. 3.—Lone Star Geyser in action. Siliceous matter in hot waters deposited to form very beautiful cone, standing on large mass of evenly bedded siliceous deposits. Photograph by Walcott.

During the investigations and collecting, numerous photographs, some of which are here reproduced, were taken by Dr. and Mrs. Walcott, of geysers and hot springs, and of deposits made from the waters through evaporation and organic agencies.

The collections were brought in to the various camps on pack



FIG. 4.—Nearer view of cone of Lone Star Geyser, showing outer appearance of deposit. Photograph by Walcott.

horses and buckboard, and subsequently packed for shipment at Fort Yellowstone and Yellowstone. Material assistance was afforded by the cooperation of the Acting Superintendent of the Park, Col. L. M. Brett, U. S. Army, and officers of the United States Engineer Corps who are in charge of the maintenance and development of the park roads and trails.

Upwards of five tons of specimens were collected and shipped to the National Museum. This collection permits of the preparation of a special Yellowstone Park exhibit of great beauty and interest.¹



FIG. 5.—Liberty Cap at Mammoth Hot Springs. A dead geyser cone slowly being destroyed through action of rain, frost, and changing temperatures. Profile on right-hand face of cone suggests spirit of dead geyser. Photograph by Walcott.

¹ In his work through the Park, Dr. Walcott was assisted by Mrs. Walcott and Messrs. Sidney and Stuart Walcott, and Charles D. Flaherty.



FIG. 6.—White Dome Geyser, near Great Fountain, in eruption with hot waters cascading down its sides. This dome is in midst of broad plain, and owes its prominence to gradual deposit of siliceous matter largely by evaporation. Photograph by Walcott.



FIG. 7.—Ruins of Grotto Geyser, with two centers of eruption, Upper Geyser Basin. Photograph by Walcott.



FIG. 8.—Platform of thin-bedded sinter deposits beneath giant geyser cone, Grotto Geyser of Upper Geyser Basin. Photograph by Walcott.



FIG. 9.—Mouth of Great Fountain Geyser showing water at rest just before a great eruption, as seen in Fig. 10. Photograph by Walcott. Alternate wetting and drying of area about the geyser results in deposition of salica in beautiful forms all about its basin.



FIG. 10. Great Fountain Geyser in eruption with arrows of water shooting 150 feet above mouth shown in Fig. 9. Photograph by Walcott.



FIG. 11. Looking down into throat of small geyser near Firehole River in Upper Geyser Basin. A type of siliceous deposit relatively rare. Photograph by Walcott.

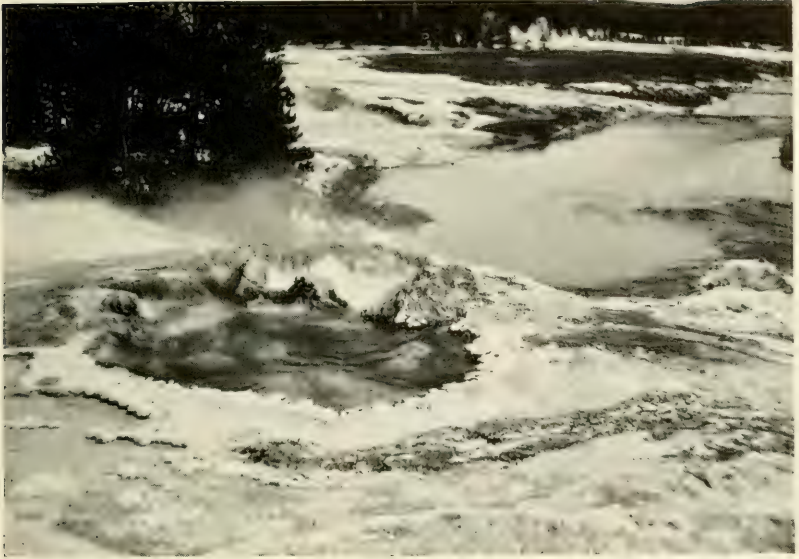


FIG. 12.—Small geyser and hot spring on bank of Firehole River, showing geyser and hot-spring deposit side by side. Small vents on side of spring erupt quite frequently. Photograph by Walcott.

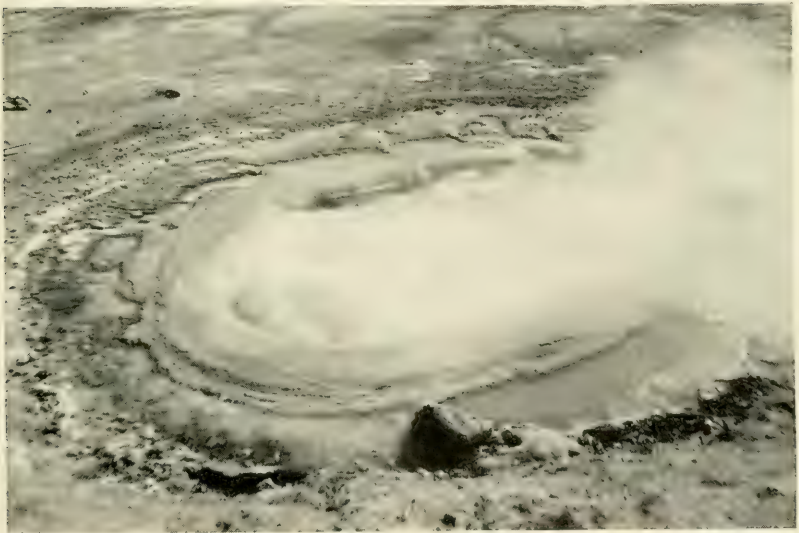


FIG. 13.—Sulphur Mountain Geyser boiling, prior to small eruption. Coloring in mouth and throat of geyser varies from rich cream above to deep red and buff below. Minor details of siliceous deposit about area flooded by hot siliceous water are most beautiful. Photograph by Walcott.

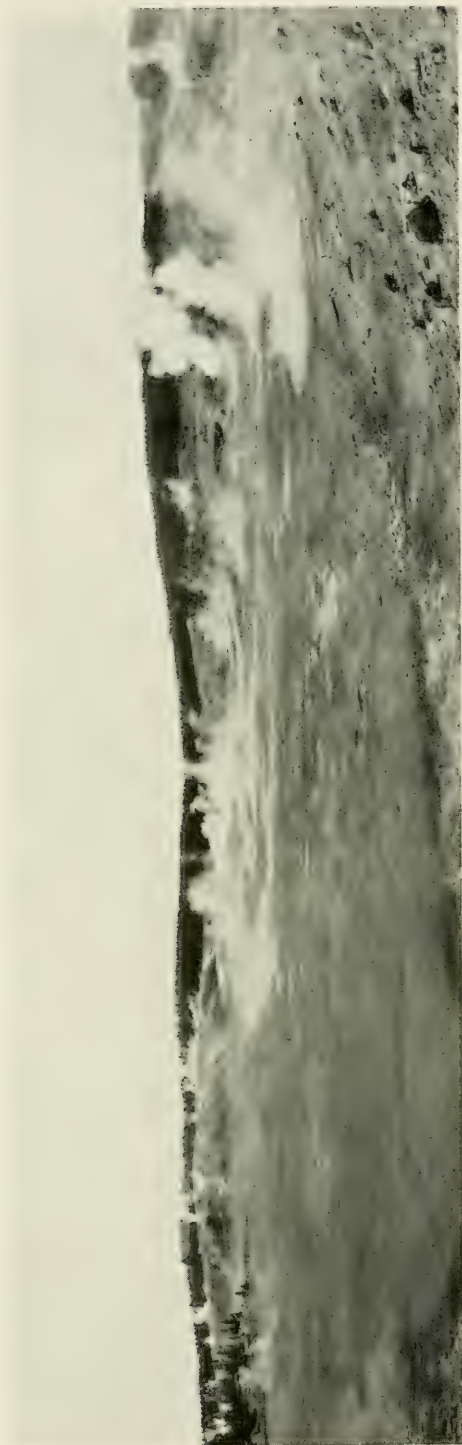


FIG. 14.—Panoramic view of Norris Geyser Basin, with several small geysers in eruption. Many fine specimens were secured for National Museum from this area. Photograph by Walcott.



FIG. 15.—Sidney and Stuart Walcott cutting out specimen near the Growler, Norris Geyser Basin. They were driven back many times before the hot rock was finally secured. Photograph by Walcott.



FIG. 16.—Algal growth in cool pond where there was no mineral matter in solution to be deposited. Photograph by Walcott.

It was found that algal growth was everywhere present when the temperature of the waters was from 70° to not much above 180° Fahrenheit, and that this growth had a marked effect upon the

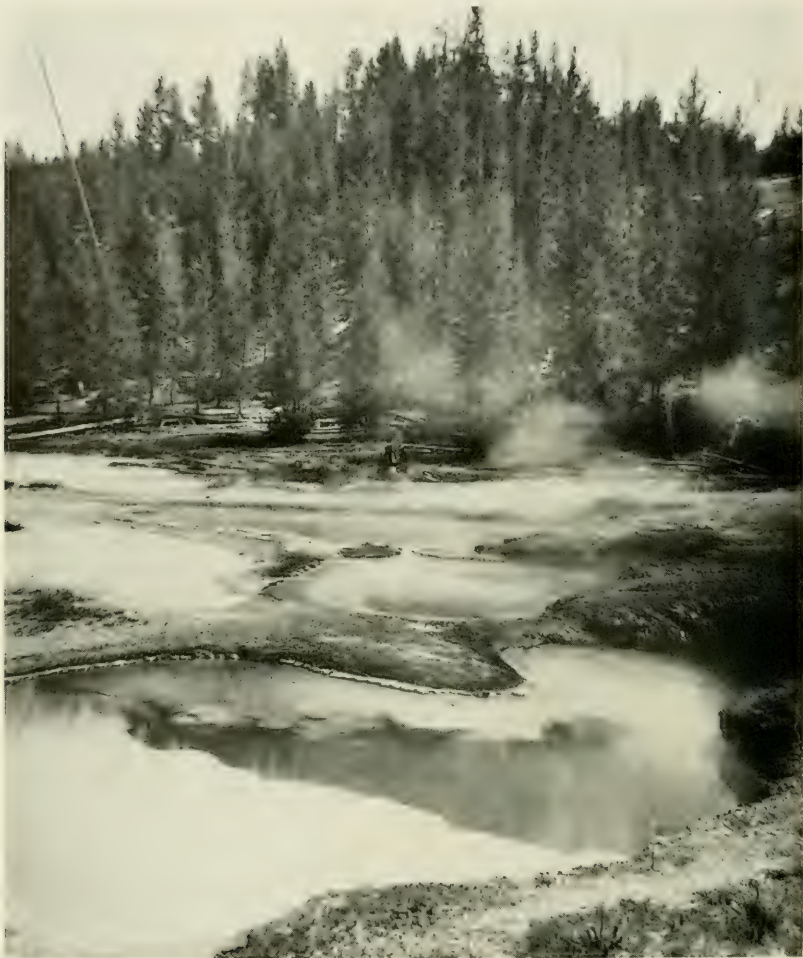


FIG. 17.—Three of the Seven Sisters Hot Springs above Black Warrior Geyser, one mile northeast of Great Fountain Geyser. These springs, although very beautiful and each of a different color, are rarely visited by tourists, and the same is true of most of the Great Fountain group. Photograph by Walcott.

amount and character of both calcareous and siliceous deposits. Some of these are shown in the accompanying illustrations.



FIG. 18.—One of the Three Sisters Springs filled with boiling hot water, through which bubbles of steam are rising. Photograph by Walcott.



FIG. 19.—Great Sulfosel Hot Spring, about one mile northeast of Great Fountain Geyser, elevation 7,300 feet. The main opening of the spring has a temperature of 201.2° F. (93° to 94° C.). Water cools toward run-off in foreground, to 172.4° F. (78° C.). Siliceous deposits about this spring extend as cornices out over edges. Algal growth abundant in water at 134.6° F. (57° C.). Fine specimens were collected for National Museum. Photograph by Walcott.

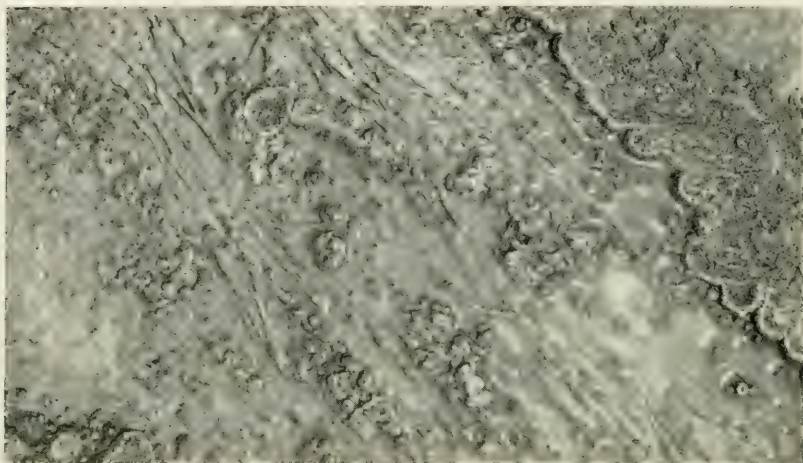


FIG. 20.—Illustration of algal growth in rapidly moving hot water in run-off from hot spring shown by Fig. 19. White siliceous deposit is made over and through algal growth, latter being gradually replaced and changed from soft gelatinous, spongy mass to hard siliceous permanent deposit. Photograph by Walcott.

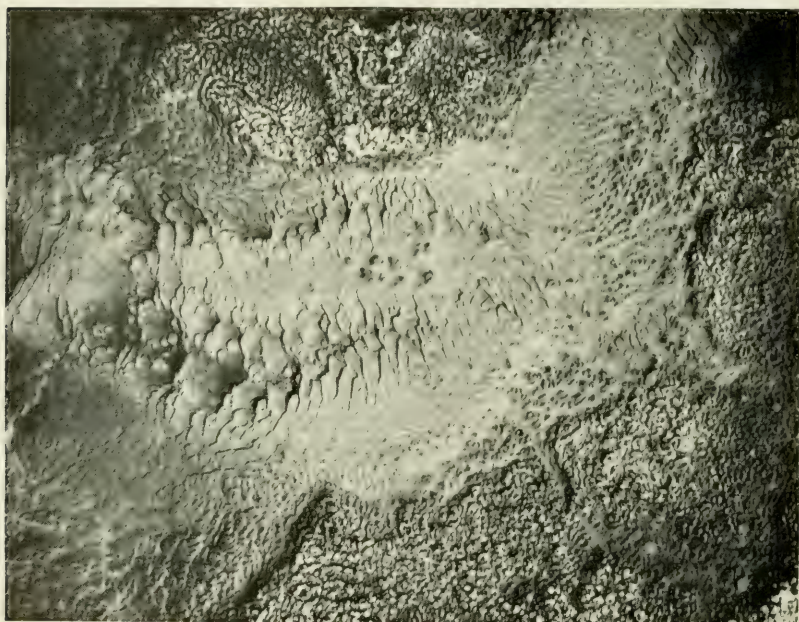


FIG. 21.—Cream-colored siliceous deposit in run-off from Artemisia Geyser, Upper Geyser Basin. Photograph taken looking down through the water. Photograph by Walcott.

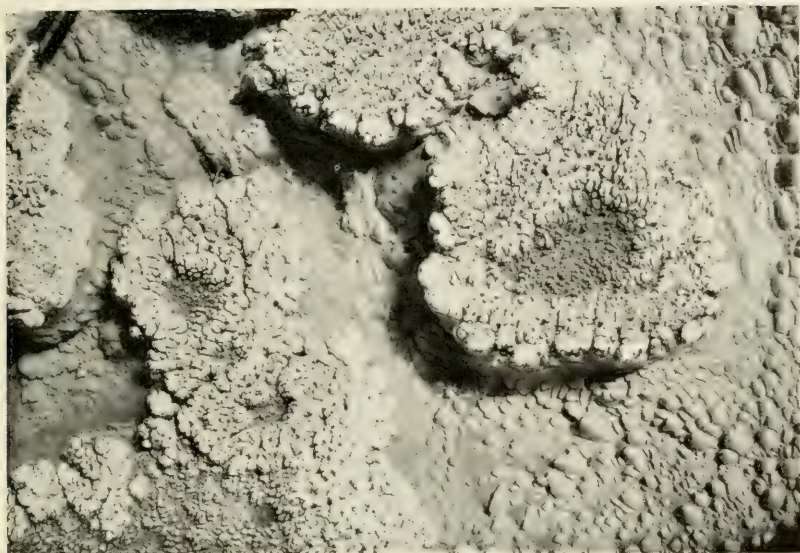


FIG. 22.—Beautiful light cream-colored siliceous deposit in run-off from Artemisia Geyser, about one-eighth natural size. Photographed looking down into the hot water. The pebbly looking bottom is from 6 to 8 inches beneath surface, and is formed by the deposit in very much the same manner as the ripple deposits in Fig. 21. Photograph by Walcott.



FIG. 23.—Yellowstone Canyon below Tower Falls Creek, showing two beautiful bands of columnar basalt interbedded in the early basic breccia formed of fragments of pyroxene-andesite, hornblende-andesite, and basalt associated with basic lava flow. Photograph by Walcott.



FIG. 24.—Beautiful "Tower Falls," short distance above canyon of Yellowstone River, in northeastern section of the Park. Photograph by Walcott.



FIG. 25.—Great Needle in Yellowstone Canyon, a half mile below Tower Falls, shown by Fig. 24. Picture taken by hanging camera in limb of a tree about 300 feet above top of Needle. Needle probably 400 to 600 feet in height. Photograph by Walcott.



FIG. 26.—Obsidian Cliff, Norris Geyser Basin, showing columnar structure in obsidian and massive-bedded rhyolite above. This cliff is one of the interesting geological phenomena of the Park. Photograph by Walcott.



FIG. 27.—Boulder of volcanic breccia rolled down from the cliffs shown in Fig. 28. Fragments forming the breccia include pyroxene-andesite, hornblende-pyroxene-andesite, and basalt. Photograph by Walcott.

After completing the investigation of the geyser and hot-spring deposits, a trip was made to the Fossil Forest in the northeastern section of the Park, in the Lamar River Valley. Large collections were made of silicified wood and various minerals; one of the latter being a remarkable and beautiful form of calcite rosettes (figs. 29, 30, 31, 32).



FIG. 28.—Looking across Lamar River from the north to fossil forest ridge 2,500 feet above the valley. Ridge formed of great thickness of volcanic breccia deposited in great layers at intervals sufficient to permit of growth of coniferous forests. Stumps of fossil trees were measured 9 feet in diameter, 6 feet above their roots. Seven successive forests that had been destroyed by volcanic deposits were seen in the cliffs shown in this view. Walcott camp in the foreground. Photograph by Walcott.

Dr. Wherry, assistant curator, division of mineralogy and petrology, U. S. National Museum, describes the calcite rosettes as follows:

The remarkable character of these specimens is illustrated by the photographs of four of them shown in figures 29, 30, 31, and 32. They consist of

close groups of thick tabular rhombohedrons of calcite, the faces of which are deeply curved into saddle-shape forms, a structure frequently found in the mineral dolomite, but comparatively rare in calcite. That the latter mineral is represented, however, was proved by qualitative chemical tests, which showed only traces of magnesium, and by measurement of the index of refraction ω , which was found to be 1.660, essentially that of calcite.



FIG. 29.—A calcite rosette collected by Mrs. Walcott and B. Stuart Walcott high up on the cliffs shown in Fig. 28. Photograph by Mr. T. W. Smillie, U. S. National Museum.

The fundamental crystallographic form toward which all of the crystals tend is the negative rhombohedron, $01\bar{1}2$. One specimen, which is shown in figure 32, approaches this form quite definitely. The angle between two adjacent faces of this crystal close to their intersection, measured with the contact goniometer, is about 46° , while the theoretical angle is $45^\circ 3'$. No other faces

have been noted on the specimens, although cleavage planes, beveling the edges of the surface form, are visible here and there. The faces of the negative rhombhedron are not smooth nor simple, but are built up of a series of innumerable smaller faces, belonging to individuals in approximate parallel position, though with enough divergence to cause the curvature of the faces; while at the thin edges of the crystals the individuals are still more distinctly

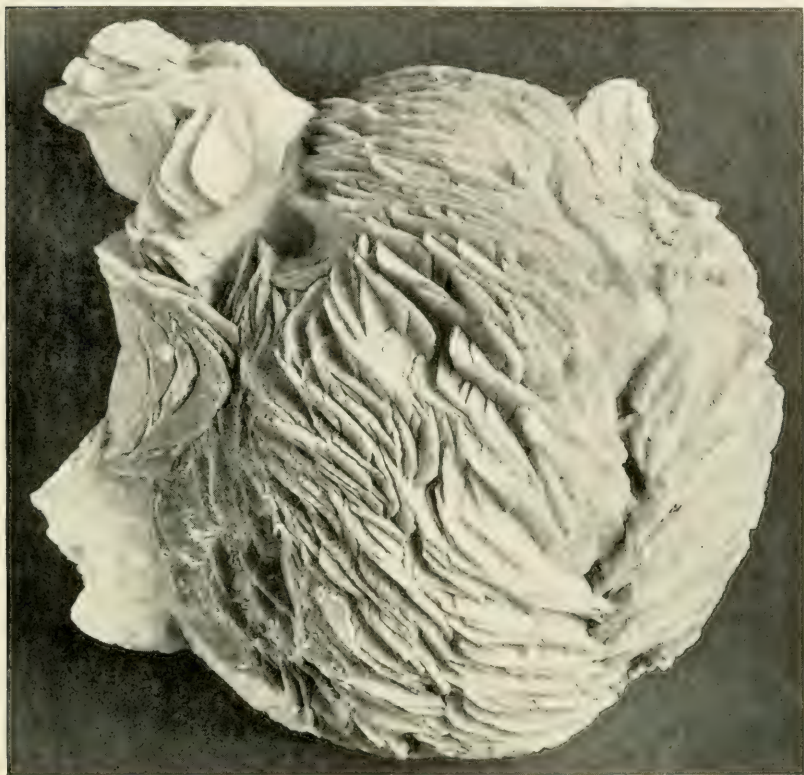


FIG. 30.—Calcite rosette showing somewhat different structure from that of Fig. 29. Dr. Edgar T. Wherry, of the United States National Museum, explains their origin as due to starting of crystallization at numerous closely crowded points, the crystals being perhaps at the start quite parallel, but as they grew crowding one another out of parallelism, although not enough to prevent approximately equal growth of every individual. He states that this type of crystallization of the mineral calcite is comparatively rare. Photograph by Mr. T. W. Smillie, U. S. National Museum.

separated, so that the effect is that of superposed layers of curved sheets, resembling the petals of the rose to such an extent that the first word to describe them which suggests itself is "rosette."

That this curvature is not merely a superficial phenomenon, due to the development of vicinal planes, as is often the case in curved crystal faces, is shown by the fact that the cleavage faces are also curved, their relative position with respect to the surface faces being always retained, no matter where they are developed. The composite character exhibited by the external faces is also shown by these cleavages, which proves that the curvature of the crystals is only apparent, and is not due to actual deformation by pressure. This is borne out by microscopic examination, for the cleavage flakes show between



FIG. 31.—Calcite rosette, varying in form from Figs. 29 and 30. Photograph by Mr. T. W. Smillie, U. S. National Museum.

crossed nicols quite uniform extinction, without a trace of the wavy darkening characteristic of crystals which have been distorted by pressure.

The origin of these specimens is to be explained, then, as due to the starting of crystallization at numerous closely crowded points, the crystals being perhaps at the start quite parallel, but as they grew crowding one another out of parallelism, although not enough to prevent approximately equal growth of every individual. The resulting groups form unusually fine display specimens, all the more interesting because of the comparative rarity of this type of crystallization in the mineral calcite.



FIG. 32.—Calcite rosette with fundamental crystal form preserved. Photograph by Mr. T. W. Smillie, U. S. National Museum.



FIG. 33.—Distant view of bison grazing on the gently sloping bottom of Lamar River Valley in northeastern section of Park; 220 bulls, cows, and calves were counted in this herd. Photograph by Walcott.



FIG. 34.—Nearer view of some of the bison shown in the distance in Fig. 33.
Photograph by Walcott.



FIG. 35.—Kodak snapshot of two bison bulls and a cow in herd shown in Fig. 34. By remaining on horseback it is possible to get quite near to some of the animals. Photograph by Mary Vaux Walcott.



FIG. 36.—View near the mouth of Squaw Creek, West Gallatin River Canyon. The rocks in the immediate foreground on the right are of pre-Cambrian age, those in the cliffs at the base of Castle Mountain are of Cambrian age, the cliffs just below the summit of Devonian age, and those forming the castle on the summit, of Carboniferous age, the entire section embracing over 3,000 feet of bedded limestone. Photograph by Walcott.



FIG. 37.—Rural delivery station, Deep Creek Canyon, Belt Mountains, 16 miles east of Townsend, Montana, where we received a promptly delivered daily mail. Photograph by Walcott.



FIG. 38.—Wood road in one of upper canyon valleys of Belt Mountains. Forest Ranger Orrin C. Bradeen coming in from patrol. Photograph by Walcott.



FIG. 39.—Summits of the Big Belt Mountains, with Mount Baldy capped by September snow. In foreground wheat harvest on dry farming slopes. Photograph by Walcott.

The camp site in the Lamar Valley was one of unusual interest and beauty (fig. 28). The high hills to the south show the rock cliffs containing silicified wood, calcite rosettes, and beautiful specimens of chalcedony. A little way from the camp the party met with a large herd of bison grazing freely in the broad open valley, also herds of elk, bands of antelope, a few black bear, and an occasional wolf.



FIG. 40.—Wheat farms on slopes farther from mountains shown in Fig. 39, where there is a commingling of dry farming and irrigation. Richness of the soil is indicated by shocks of wheat.

On leaving the Park, after 675 miles of travel with the camp outfit, the party proceeded down the West Gallatin River Canyon, stopping to examine the section of Cambrian rocks at the mouth of Squaw Creek (fig. 36). The next permanent camp was made in Deep Creek Canyon, 17 miles east of Townsend, Montana, where the extensive pre-Cambrian sections of the Big Belt Mountains are beautifully shown. About two tons of pre-Cambrian specimens were collected in this vicinity, before the storms of late September closed the season's field-work.

THE INDIANA MASTODON

Each year the Museum receives reports of many finds of mastodon and mammoth remains, especially from different localities in those States bordering on the Great Lakes. These "finds," which come for the most part from swamp deposits of the Pleistocene, usually consist of a few isolated bones or teeth, but they give evidence of the great abundance of these larger creatures which roamed over this continent during the geological age just preceding the present. Compared, however, with the great number of remains found, complete skeletons are rare. This is due in large part to the fact that by far the greater number of the finds are made by men of no



FIG. 41.—Ditch where Indiana mastodon was found. The long iron rod was used in probing in the swamp for the remains. Photograph by Gidley.

experience in collecting and usually little or no knowledge of what they are finding. The National Museum is therefore fortunate in the recent acquisition of a fine, nearly complete adult male mastodon skeleton from a swamp deposit in northwestern Indiana.

This specimen was donated to the National Museum by Mr. W. D. Pattison of Winamac, Indiana, and Captain H. H. Pattison, U. S. Army, on whose farm, about 15 miles northwest of Winamac, it was found.

A part of the skull, four limb bones, a few ribs and vertebræ, were unearthed by a dredge crew while excavating a drainage canal on the Pattison farm in the spring of 1914 (see fig. 41). On learning of the discovery, Mr. Pattison took immediate steps to preserve these bones, but before he could prevent it a few of them were carried

away as curiosities by people of the vicinity. These were, however, for the most part recovered. Mr. Pattison, recognizing the value for public exhibition of such a specimen if properly handled, and judging correctly that the greater part of the skeleton might be secured by an experienced collector, very generously packed and shipped the bones then in his possession to the National Museum, at the same time extending an invitation to the Smithsonian Institution to send an expedition to his farm to recover, if possible, the remaining parts of the skeleton. A small appropriation was set aside for this purpose, and the first expedition to the Pattison farm, under the direction of J. W. Gidley of the National Museum, was undertaken in June, 1915. This resulted in securing the lower jaws, most of the remaining vertebræ and ribs, parts of the pelvis, and a few more limb and foot bones. The undertaking was too extensive for the funds then available, and Mr. Gidley was obliged to return to Washington before the search was completed. Most of the bones secured on this trip were found in working over the material thrown out by the steam shovel on either side of the ditch at the time the dredging was done.

In October a second appropriation was made available, and Mr. Gidley again visited the locality of the find, this time completing the work which resulted in securing from the undisturbed deposit at the bottom of the ditch the last of the missing sections of the vertebral column, several more foot bones, and other important fragments.

At this time it was necessary to sink a coffer-dam across the ditch, which is about 20 feet wide, and at this place contains about six feet of water and mud before coming to a hard sand bottom. Mr. Gidley thus was enabled to study the formation and make an accurate estimate of the conditions of deposition of the skeleton.

On assembling in the laboratory the bones of this skeleton received from all sources, it has been found that, with comparatively little artificial restoration, a much more than usually fine and complete specimen of the American mastodon can be assembled. This is now being mounted and will soon be placed on exhibition as one of the striking features of the Fossil Vertebrate Hall.

PALEONTOLOGICAL AND STRATIGRAPHIC STUDIES IN THE PALEOZOIC ROCKS

Dr. E. O. Ulrich, associate in paleontology in the U. S. National Museum, was occupied for several months during the field season of 1915, under the auspices of the U. S. Geological Survey, in a study of the Lower Paleozoic deposits of the Mississippi Valley. He

was engaged chiefly in seeking evidence respecting the boundary line between the Cambrian and Ozarkian systems. For this purpose many of the outcrops of these rocks were visited, but the most important evidence was found in the Upper Mississippi Valley and in Missouri where the Upper Cambrian rocks are particularly well displayed, and the succeeding deposits of the Ozarkian system are more commonly fossiliferous than elsewhere. The relative abundance of fossils in these areas permitted the actual boundary between the two systems to be accurately determined after considerable study. This boundary, when determined, was found to coincide with the uneven plane (see fig. 42) formed at the junction of the deposits

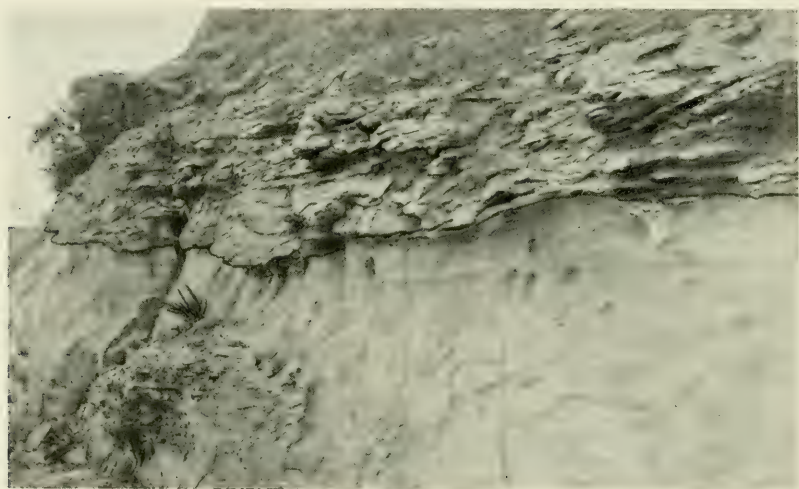


FIG. 42.—Contact between Cambrian (Jordan sandstone) and Ozarkian (Oneota dolomite) two miles south of Boscobel, Wisconsin. The undulating line of unconformity is distinctly visible. Photograph by Ulrich.

laid down by the retreating Cambrian sea and by those formed by the return of the waters in the succeeding Ozarkian time. During the progress of these stratigraphic studies numerous collections of fossils were secured for the Museum series, and incidentally the investigations resulted in the proper placement of many fossils whose stratigraphic position had hitherto been uncertain.

In the latter part of the season Dr. Ulrich worked out the field relations of some insufficiently located collections of Paleozoic fossils made in southwest Virginia at various times in the past. The most important result of these investigations is the proof that a large coral

fauna, exceedingly like that which marks the horizon of the Onondaga limestone throughout the extent of this well known and widely distributed Middle Devonian formation, had already invaded the continental basins as far as southwest Virginia during the closing stages of the preceding Lower Devonian. This instance of recurring fossil faunas is regarded as one of the most important of the many similar instances that have been established through the field studies of Dr. Ulrich during the past 25 years. All have served in correcting erroneous correlations of formations that had arisen through the confusion of earlier or later appearances of faunas with the one recognized in the standardized sequence of stratigraphic units.

Mr. R. D. Mesler, under the supervision of Dr. Ulrich, spent the summer of 1915 in making collections of Ordovician and Silurian fossils from formations and localities in the Appalachian and Mississippi Valleys which had hitherto been little represented in the Museum collections. A large number of fossils resulted from his trip, particularly from the Middle Ordovician rocks of east Tennessee, which will form the basis of a future monograph on the paleontology of that region.

EXPLORATIONS IN SIBERIA

Through the liberality of a friend the Museum was enabled to send Mr. B. Alexander with the Koren Expedition to the Kolyma River region of northern Siberia. The expedition left Seattle, Washington, about June 1, 1914, and returned a year from the following September. The immediate purpose of the trip was to obtain remains of large extinct animals, particularly of the mammoth for which the region is noted. The results were not all that were hoped for, but a considerable quantity of material was obtained, though no complete skeleton.

The following report, with photographs taken by his party, was submitted by Mr. Alexander at the conclusion of his field-work:

In May, 1914, the Smithsonian Institution appointed me as a collector, with instructions "to obtain geological, mineralogical, and paleontological specimens" for the Institution, and particularly "to secure remains of the Siberian mammoth" in the Kolyma Valley, northeastern Siberia. For this purpose I was attached to a trading company which left Seattle in a small power schooner June 24, 1914, arriving at Nizhni Kolymsk on August 26.

Nizhni Kolymsk is the oldest and outermost permanent Russian settlement in the Yakutsk government, northeastern Siberia. The village now consists of about 26 inhabited log houses and one Russian orthodox church, and is located near the 69th degree of northern latitude, a short distance above the mouth of the Kolyma and just inside the Arctic tree limit.

The Kolyma is the most easterly of the great rivers of northern Siberia, and is here about three versts (two miles) [a verst is 0.621 mile] wide. It heads in the Stanovoi Mountains and approaches the Alaskan Yukon in length, drainage, and volume.

The town site is situated near the lower end of a narrow, low island surrounded by two arms of the Kolyma River and about 100 versts long. Near the upper end of this island the Omolon empties into the Kolyma from the right. Opposite Nizhni Kolymsk and but a few versts apart, the two Anyui rivers—Big and Little—flow into the Kolyma, likewise from the right.

These three rivers are the most important tributaries and head also in the Stanovoi Mountains. But while the mountain passes beyond the sources of the Kolyma and Omolon lead to tributaries of the Sea of Okhotsk, the headwaters of the two Anyui connect with those of the Anadyr.



FIG. 43.—Little Anyui River. First elevated silt bank, showing detail; going up-river, September, 1914.

As there remained only a few weeks of open weather before the beginning of winter, I concluded the nearest field for promising research would be the two Anyui rivers. Accordingly I started upon my first exploring trip on September 3 in the schooner's dory, accompanied by three members of the party who intended to do some hunting and photographing.

We entered the Little Anyui and explored this river for a distance of approximately 150 versts from the mouth upward. For about the first 100 versts the ascent was quite easy and made by rowing. After that tracking had to be resorted to almost exclusively, the current of the river increasing rapidly almost at once.

For the lower 100 versts the river flows—after the manner of many sub-Arctic rivers in Alaska and Canada—through a low tundra, covered with dense willow thickets and puny larches, the east forelopers of the great Siberian taiga that stretches from the Urals to the Pacific. The river course forms enormous bends swinging alternately from the right to the left. The

current cuts away the unconsolidated alluvium of the outer bands (here generally from 10 to 20 feet high), depositing the material removed in the shape of extensive bars on the inner curves below.

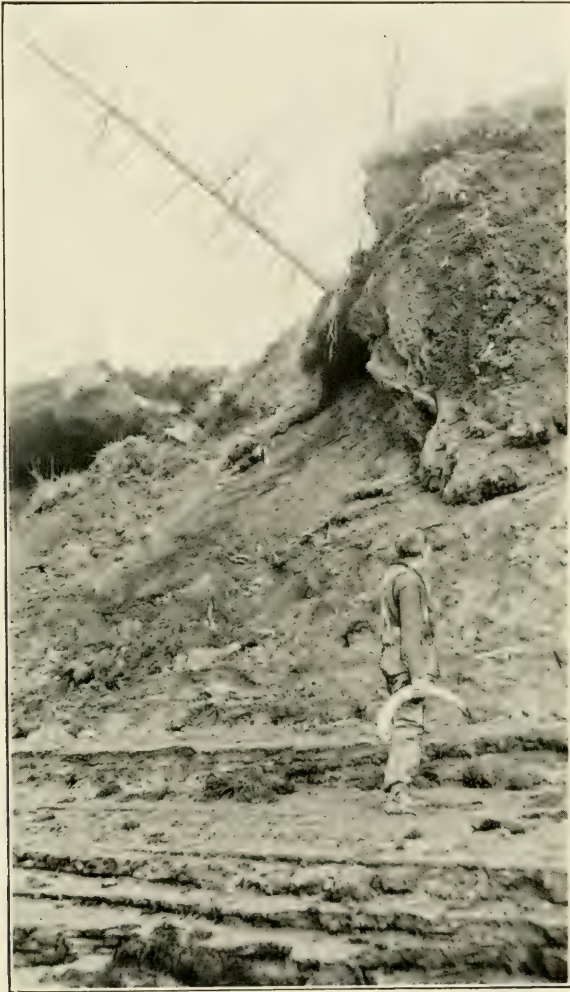


FIG. 44.—Little Anyui River. Third elevated silt bank, showing detail near center. Up-river trip, September, 1914.

These bars are generally quite boggy on the water's edge and mostly covered with driftwood piles and a rich verdure of equisetum—now swiftly dying or already dead—upon which the numberless swarms of wild geese have been fattening that are now gathering together to return to the South.

The driftwood is composed not only of the larches of the lower river, but also frequently of birches and poplars that thrive along the upper river reaches.

Many decaying cabins, long since deserted, prove that at some former time a comparatively numerous population lived along the river banks.

On the steep higher banks, thawed by the sun and undermined by the current, frequently large outer slabs slide into the stream, carrying with them willows and larches that grew upon the meager upper crust. Under the remaining overhanging drapery of tenacious moss and lichen, thin, peaty layers alternating with clear ice and frozen silt may be observed.

Approximately 100 versts above the mouth of the Little Anyui the first elevated silt beds—so characteristic of the fossil deposits along the Yukon—were observed on the right bank reaching a height of about 100 feet and



FIG. 45.—Little Anyui River. Third elevated silt bank, looking up-stream from lower end. Up-river trip, September, 1914.

extending for three versts along the whole outside curve of the river. During the next 50 versts five more similar silt ridges came into view along the outside bends of the river front.

The second one was on the left bank, about 80 feet high and fronting the river for about 100 yards.

The third elevated silt bank was once more on the right bank of the river, from 100 to 150 feet high and occupying, as did the first, the whole length of the outer river bend, this time about four versts long.

The fourth and fifth ridges (both on the right river bank) were only about each 300 yards long and reached a height of approximately 80 feet.

The sixth (and last) ridge observed was on the left bank of the Little Anyui River, extended for about 300 yards and reached a height of approximately 80 feet.

The fifth and sixth high silt banks, separated from the main branch of the river by shallow sloughs, exhibited no recent slides, were largely overgrown by vegetation, and yielded practically no fossils, which the lower four silt ridges did abundantly.

Among the fossils collected, the remains of wolverine, bison, deer, and mammoth were easily recognized on the spot.

All these fossils found were carried to convenient shelves on the base of the silt bluffs and marked by stakes driven into the ground, to be picked up and

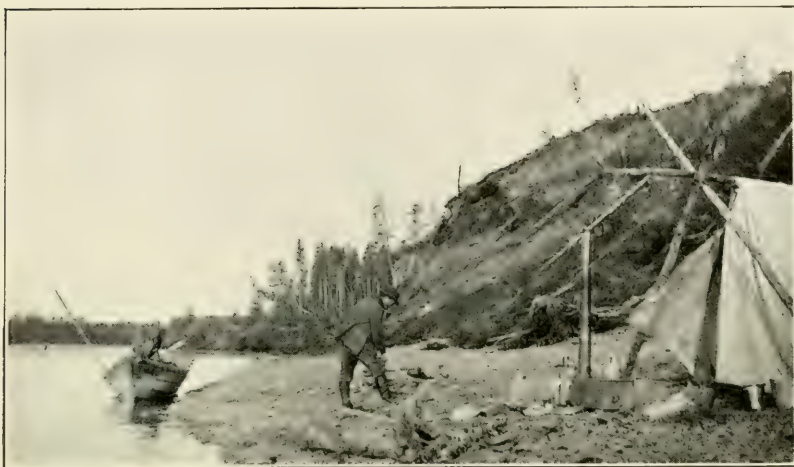


FIG. 46.—Little Anyui River. Fourth elevated silt bank, showing camp. Up-river trip, September, 1914.



FIG. 47.—Little Anyui River. Sixth elevated silt bank, separated by slough from Anyui proper. No fossils found. Down-river trip, September, 1914.

taken to Nizhni Kolymsk on our return trip. This precaution proved to be quite necessary, as a thin crust of newly fallen snow covered the ground before we reached the settlement again.

The general aspect of these different elevated silt banks resembled very much that of similar places in Alaska and Yukon Territory. The tops of the high, steep ramparts were overgrown with moss, lichen, a few Arctic plants, and grasses—among them our own "Labrador tea"—and thin larches without any underbrush. The lower moist places of the surface exhibited an abundance of "niggerheads."

Through many deep, narrow, cross gullies, worn by erosion into these elevated silt beds, little streams of muddy water trickled into the river below.

Often there was no shelf at all at the base of these elevated silt beds. Sometimes the shelves were extremely miry, overrun by sticky mud avalanches and very difficult of access.



FIG. 48.—Big Anyui River. First elevated silt bank, looking up-stream, June, 1915.

Bedrock was nowhere observed. However, during the last third of the journey the current became rather suddenly swift and greatly obstructed further progress of the clumsy dory. A fine reddish gravel appeared on the river bars, mixed with quartz and slate pebbles, rapidly increasing in size. As soon as the gravel appeared, small fossils began to show on the river bars, while the mud flats below had been entirely bare of such. On the last camping place reached, fossils were found on the bars, and other elevated silt ridges apparently bordering the river farther above were noticed.

Finally the advanced season and lack of supplies compelled us to return. Approximately 50 versts above the mouth of the Little Anyui, we were directed by a lonesome half-breed fisherman—the only human being we met on this river—to a connecting slough which took us into the Big Anyui.

There we heard from another settler of three fossil banks farther above on the Big Anyui, but could not examine them at the present time. The winter was too near. I resolved, however, to return at the earliest opportunity.

We reached Nizhni Kolymsk September 29 with our last provisions and the first permanent snow. Two weeks later winter was upon us in good earnest and the broad Kolyma was frozen over solidly.



FIG. 49.—Big Anyui River. Second elevated silt bank near center, looking up-stream. June, 1915.



FIG. 50.—Tundra silt facing ocean. Notice amount of driftwood in this little gully. The mammoth skull was found about 300 yards from the beach. Between Cape Big Baranoff and Chaun Bay. August, 1915.

During the long winter months I had no opportunity whatever for further research.

The breaking up of the ice in 1915 was exceptionally gentle and early. By the middle of June the usual spring freshet, following the break-up, had so far subsided that I thought it feasible to make another attempt to revisit the fossil places examined the previous fall and to extend my explorations to the elevated silt beds reported to be on the Big Anyui River.

This time I hired a "carbass," one of the light fishing boats of the natives, and set out on June 17, 1915, accompanied by the photographer of the party.

All the elevated fossil banks on the Little Anyui were overhauled once more carefully with the exception of the last two that had yielded no fossil material before and were not likely to do so now. This time only a few scattered insignificant fossil remains could be found. All these places were practically as bare as I had stripped them the previous fall. The reason is evidently this: All these silt ridges were freezing fast when I left them late in September,



FIG. 51.—Tundra beach near Chaun Bay. Fossils found here, August, 1915.

1914. The power of the sun, still feeble, had not yet been able to thaw them, nor had the water, running only such short time again, been able to undermine them. Therefore, no recent slides had occurred and no new fossil remains had been brought to light.

We hurried downstream again, entered—by the same connecting slough mentioned above—the Big Anyui and went up river. In general appearance this river is practically an exact counterpart of the Little Anyui.

Approximately 60 versts above the mouth of the Big Anyui a first elevated silt ridge, two versts in length and about 80 feet high, was encountered on the left river bank. Fifteen versts farther on a second one of the same dimensions appeared on the same side. And finally, another 15 versts beyond and facing the river likewise on the left bank, a third silt ridge of about the same height but only half the length was met with. The general appearance of these frozen bluffs did not in any way differ from that of similar places on the Little Anyui described above.

From the second ridge on upward the heretofore rather sluggish river current quickened perceptibly and quite suddenly. Again pebbles and small fossil remains appeared on the bars, formerly composed only of very fine alluvial matter.

All these three places yielded a moderate amount of fossils. These remains are now all in the possession of the United States National Museum.

At midnight, on July 1, we returned to Nizhni Kolymsk, and five days later our schooner left on the return trip. I reached Nome on September 17, and Seattle on October 9.

Between Cape Big Baranoff and Chaun Bay a few more fossils were added to the collection. Some of them were found on the base of the elevated tundra silts facing the ocean, on many places between mountain ridges. The elevations of this tundra beach differ greatly according to locality. The surface of



FIG. 52.—Tundra beach near Chaun Bay. This picture shows detail of central part of figure 51, which compare. Fossils found here.

the frozen tundra was in August, 1915, overgrown with luxuriant Arctic grasses and herbs. The driftwood found along the beach comes from distant localities and has been brought down by the large rivers of the north. In many instances it is even undoubtedly of American origin.

Some of these fossils—among them a fairly complete mammoth skull—were found in little cross gulches dug by small water courses.

Mr. J. W. Gidley, in charge of fossil mammals in the National Museum, reports that the collection of bones sent in by the Siberian expedition contains a few fine specimens together with a considerable number of isolated bones which are valuable for study and comparison. They all indicate a late Pleistocene age, as the bones of many of the forms represented can with difficulty be distinguished from those of species still living in that region.

The animals represented in this collection are as follows: Mammoth (*Elephas primigenius*), bison, carabou, horse (two or more species), rhinoceros, musk-ox, wolverine, and wolf.

The prize specimen of the collection is a finely preserved, almost complete skull of *Elephas primigenius*. It is of especial interest in that this is the only skull of the Siberian mammoth in any of our American museums.

COLLECTING FOSSIL ECHINODERMS IN THE OHIO VALLEY

The explorations for fossil echinoderms during the summer of 1915, conducted under the supervision of Mr. Frank Springer, associate in paleontology in the U. S. National Museum, were limited to two areas of Silurian rocks in the Ohio Valley from each of which much valuable material was procured for the study of certain definite problems. In southern Indiana Mr. Herrick E. Wilson, under Mr. Springer's direction, spent a number of weeks quarrying for Niagaraian echinoderms, particularly crinoids, in the vicinity of St. Paul where numerous outcrops of the Laurel limestone occur. The object of this work was to secure as many specimens as possible for comparisons of this peculiar fauna with those from European Silurian rocks. Not only was much material obtained by the quarrying operations, but all of the local collections of fossils were purchased for Mr. Springer so that the Museum, which hitherto had practically no fossils from the Laurel limestone, is now in possession of a splendid general collection of fossils from this particular formation.

The second area of exploration was in west Tennessee along the Tennessee River where Mr. W. F. Pate spent some weeks in searching for the peculiar crinoidal bulb, *Camarocrinus*, and the associated crinoid, *Scyphocrinus*, both of which Mr. Springer has proved to belong to the same organism. Mr. Pate was successful in finding several localities where excellent specimens of the *Camarocrinus* and *Scyphocrinus* were associated. Much material was secured and the specimens will be used in the preparation of Mr. Springer's monograph upon this group of crinoids.

GEOLOGICAL WORK IN PENNSYLVANIA AND VIRGINIA

Dr. Edgar T. Wherry, assistant curator of the division of mineralogy and petrology, U. S. National Museum, by arrangement with the U. S. Geological Survey, continued his studies of the geology of the Reading quadrangle in eastern Pennsylvania for a month during the summer. He completed the areal mapping of the Cambrian and Ordovician rocks of the region, and has transmitted to the Survey the manuscript of a report upon his work. He also mapped Cam-

brian and Triassic formations on the Quakertown and Doylestown quadrangles, which lie to the east of the Reading.

A brief visit was made to a newly discovered cave near Lurich, Virginia, where the cave marble was reported to be of economic importance. This view proved to be unjustified, but some unusual stalactitic formations were found, two specimens of which were obtained for the Museum collections.

GEOLOGICAL SPECIMENS FROM NEW ZEALAND

By an arrangement with Prof. Joseph P. Iddings, the Institution was enabled to secure during the year, a number of boxes of rock



FIG. 53.—A typical Buggi's house at Toli Toli, Celebes.
Photograph by Raven.

material and fossils from New Zealand and Tahiti, where Prof. Iddings was engaged in geological work during 1915. This material is a valuable addition to the Museum's collections for study and comparison.

EXPEDITION TO BORNEO AND CELEBES

Mr. H. C. Raven's material from Celebes alluded to in last year's exploration pamphlet¹ was received early in 1915. It includes 464 mammals, 870 birds, 50 reptiles, and some miscellaneous specimens.

¹ Smithsonian Misc. Coll., Vol. 65, No. 6, pp. 23-25.



FIG. 54.—The *Alnoer* anchored off Soemalata, Celebes.
Photograph by Raven.



FIG. 55.—At Soemalata, Celebes. Photograph by Raven.



FIG. 56.—A Celebean lemur (*Tarsius*).
Photograph by Raven.

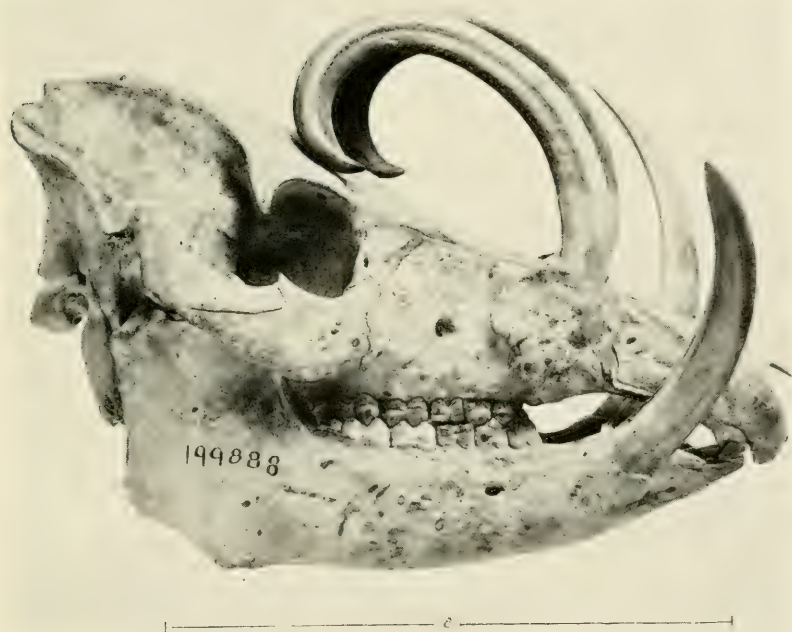


FIG. 57.—Skull of the Babirusa, a pig peculiar to Celebes and adjacent islands.
Collected by Raven.

The mammals and birds are of great value to the Museum as the first adequate representation of a fauna that has particular interest in connection with previous work on other parts of the Malay Archipelago. Some of Mr. Raven's Celebean photographs, also that of the skull of a babirusa, which he collected, are here reproduced (figs. 53 to 57). Early in the summer Mr. Raven returned to America and spent several months on vacation and in preparing for further explorations in Celebes and other parts of the East Indies. Doctor Abbott has generously offered his continued support to this work. Mr. Raven left Washington for the east by way of Japan and Singapore, about the middle of October. Two months later he reported from Buitenzorg, Java, that he was making good progress toward the collecting ground.

EXPLORATIONS IN CHINA AND MANCHURIA

Mr. Arthur de C. Sowerby has been very active in China and Manchuria. Early in the year he made a short trip to the recently opened hunting reserve, about 60 miles northeast of Peking, north of the Eastern Tombs, and south of Jehol. Here, he writes, "I found a well wooded district which I am convinced contains a lot of new stuff. The best thing that I got was a series of squirrels of a species quite new to me. They are striped like chipmunks, but have a thick, soft, much more grayish fur. They are almost entirely arboreal in habits, living in holes in oak trees. These squirrels are very active and take enormous leaps from one tree to another, though they cannot be said to 'fly.' There is no cheek pouch as in the chipmunks." He also obtained an interesting hare, and a cat, *Felis euptilura*, not previously represented in the Museum by a good specimen. The squirrel is a representative of a group hitherto unknown in northeastern China. It has been described as a new species under the name *Tamioops vestitus*.

In March and April Mr. Sowerby visited the Tai-pei-shan district of southern Shensi with the special object of observing the race of Takin, a large goat-like animal, peculiar to that region. "I am pleased to say," he writes under date of May 29, "that I have a fine bull Takin (*Budorcas bedfordi*) for you which I shot at 300 yards range. It is an enormous animal." The skull of this individual is shown in figure 58. He further obtained a female of the Chinese musk deer, now becoming very scarce as the result of excessive hunting by the natives; also a few interesting small mammals including four pikas, small, lemming-like animals related to the hares. "The

little pikas simply swarmed above an altitude of 8,000 feet, and it was only because I was exhausted with the difficulty of the country



FIG. 58.—Skull of the South-Shensi Takin. Collected by Sowerby.

and the hard work entailed in hunting the Takin that I did not collect more."

During July, August, and September an important expedition was made to the lower reaches of the Sungari River and the I-mien-po

district in north Manchuria. Of his experiences Mr. Sowerby writes: "Had a fearful trip this time owing to floods, insect pests, and dysentery; still I have some 70 or so mammals, 35 birds and a good collection of fish. I have the skull of a good black bear. The skin went bad owing to our being delayed by Russian police. Also I have a good hide and skull of a wapiti, besides series of various small mammals." Of the specimens obtained, only a small package sent by mail has been received in Washington. It includes three species not hitherto represented in the Museum collections.



FIG. 59.—The *Eagle* in winter quarters at Nizhni Kolymsk
Photograph by Amory.

December and January found Mr. Sowerby at Shanghai and on the Yangtze. He visited the Sikawei Museum to see the collections of Chinese large mammals that formed the basis of the writings of Heude. As this is the first time that these specimens have been examined by anyone acquainted with present-day methods in the study of mammals the result of Mr. Sowerby's observations will be awaited with much interest. They must, however, be reserved for a later report.

GERRIT S. MILLER, JR.

WORK BY COPLEY AMORY, JR., IN EASTERN SIBERIA

In June, 1914, Mr. Copley Amory, Jr., a collaborator of the National Museum, joined the party accompanying Captain John Koren to the northeast coast of Siberia. The party left Seattle on June 24

and reached Nome, Alaska, in July. A photograph of the *Eagle*, the schooner in which they sailed, appeared in last year's report on explorations (fig. 25).¹ The same boat is here shown (fig. 59) in winter quarters. Collecting in Siberia began on July 31 at Emma Harbor, the innermost part of Plover Bay. A view of the harbor and its surroundings is given in figure 60. After a week's work here the party went north through Bering Strait and then west along the north coast to Nizhni Kolymsk near the mouth of the Kolyma River. They arrived here about the end of August and established



FIG. 60.—Emma Harbor, Siberia. Photograph by Amory.

permanent headquarters. Large collections were made at Nizhni Kolymsk during the autumn and winter, while from this point as a base special trips were undertaken up the Little Anyui River (September 6 to 16, November 9 to 26, and December, 1914), up the Kolyma to Verkhni Kolymsk (March and April, 1915), and to the foothills of the Tomushaya Mountains west of Verkhni Kolymsk (May, 1915). In August and September Mr. Amory with the *Eagle* made the return voyage to Nome.

As his part of the results of the expedition Mr. Amory turned over to the National Museum 365 mammals, 264 birds, and various miscellaneous specimens principally of plants, fish, and birds' eggs. Most of this material was prepared by Mr. Amory himself, though

¹ Smithsonian Misc. Coll., Vol. 65, No. 6, p. 26.

various members of the expedition contributed to the collections of both mammals and birds. At present the Amory collections are being



FIG. 61.—Chookchees in their “kayaks,” skin-covered boats used by the men in hunting aquatic animals, especially seals. Photographed by Amory near Cape North.

studied with every prospect of important results. Among the mammals about 25 wild species are represented. These are of particular

interest as furnishing opportunity to compare the many Alaskan species well represented in the Museum with their nearest Asiatic



FIG. 62.—Tungus family breaking camp in foothills of Tomushaya Mountains. They ride their reindeer and use no sleds (sleds in foreground belong to Amory). Note similarity of lodge structure to that of Chippewa and Montagnais Indians. Photograph by Amory.



FIG. 63.—On the trail between Sredni and Verkhni Kolymsk, showing the two methods of winter travel on the upper Kolyma. Except the first pair each reindeer is tied to the sled in front of it.

relatives. The skull and antlers of the moose shown in figure 64 present a striking example of the similarity which exists between

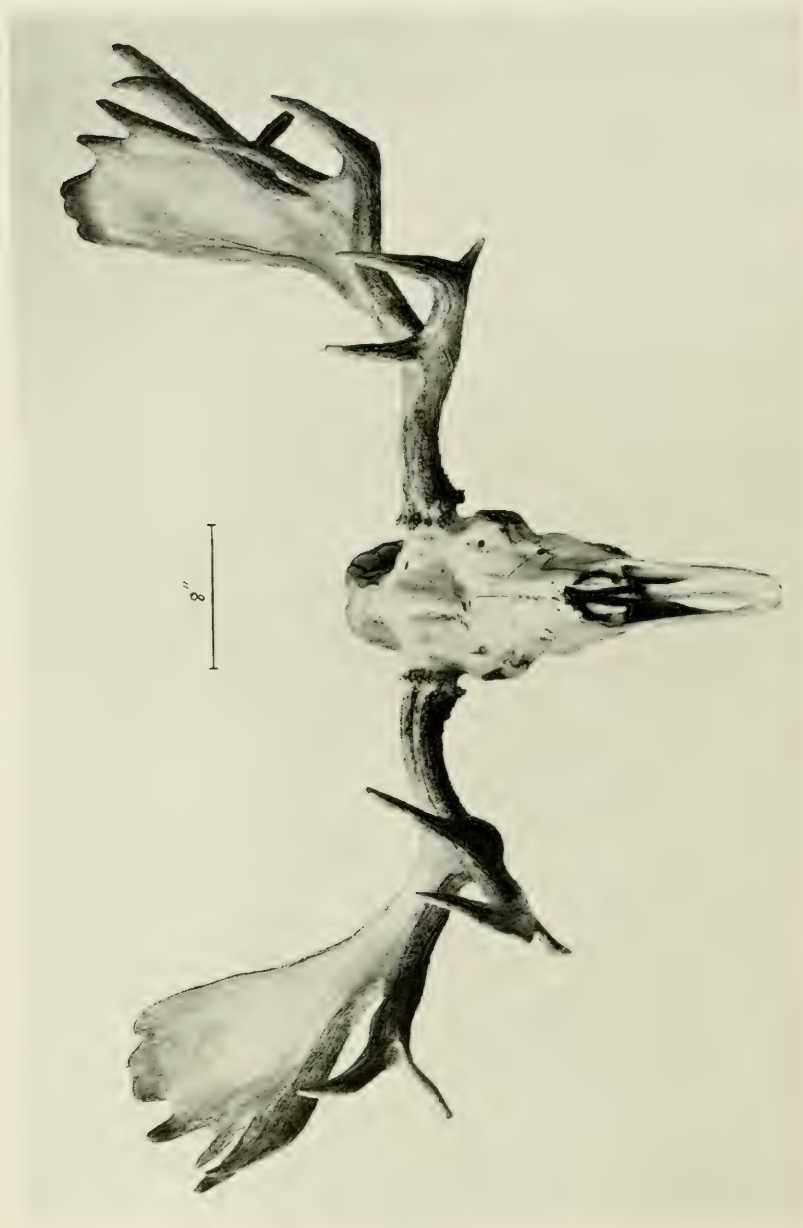


FIG. 64.—Skull of the East-Siberian Moose. Collected by Amory.

Asiatic mammals and their better-known American representatives. Several interesting photographs contributed by Mr. Amory are also reproduced.

GERRIT S. MILLER, JR.



FIG. 65.—At the fur market at Pontilayka, 40 versts northwest of Nizhni Kolymsk. The large men are Chookchees. Their reindeer parkas are covered with drill parkas on which the breath does not frost. Photograph by Amory.



FIG. 66.—Chookchees in a walrus skin "umiak" near Cape Yakan. Note that this boat is not overloaded, although there are at least 14 people aboard. Photograph by Amory.

EXPERIMENTS WITH CERIONS ON THE FLORIDA KEYS

The Bahama Cerion Colonies planted on the Florida Keys were examined by Dr. Bartsch this year between June 18 and 30. A more detailed report of the status of the various colonies was published in the Year Book No. 14 of the Carnegie Institution of Washington, pages 194-196.

A large number of adult specimens of the first generation of Florida grown individuals were found, and these show much more



FIG. 67.—Noddy terns (*Anous stolidus*) on their nesting ground, Bird Key, Tortugas.

fully than the scanty material available last year did, that this first generation has responded to the new conditions in a remarkable manner. The facts which were pointed out in a paper by Dr. Bartsch, Publication No. 212 of the Carnegie Institution of Washington, pages 203-212, plates 1-8, have been fully substantiated and materially added to by the data obtained this year.

A new experiment was started in the transplantation of 307 specimens of the Florida tree snail *Liguus fasciatus* to the Tortugas, one set of which was planted on Garden Key within the Fort, and two on Loggerhead Key.

As in previous years records on the birds observed on the Florida Keys and the southern portion of the peninsula were kept, and these observations have been published in the Year Book No. 14 of the Carnegie Institution for 1915, pages 197-199. The past two years have yielded a list of 76 species to which 13 were added this year, bringing the total list of birds noted to date to 89.



FIG. 68.—Sooty terns (*Sterna fuscata*) on their nesting grounds, Bird Key, Tortugas.

BIOLOGIC STUDY OF CHESAPEAKE BAY

In October, 1915, the United States Bureau of Fisheries began a hydrographic and biologic study of Chesapeake Bay. The work being carried out under the direction of Mr. Lewis Radcliffe with the aid of the Fisheries steamer *Fish Hawk*.

Two cruises were made in 1915. On the first, which extended from October 25 to October 28, Mr. Wm. B. Marshall, assistant curator, division of marine invertebrates, represented the National Museum, while on the second, which covered the period from December 2 to 6, Mr. Clarence R. Shoemaker of the U. S. National Museum

took part. During the first cruise observations were made at 30 stations, that is, 8,336 to 8,365 inclusive. These stations extended from the lower bay to the mouth of the Patapsco River, while during the second cruise 35 stations were examined, Nos. 8,366 to 8,390 inclusive, which approximately covered the same parts of the bay examined during the first trip. The efforts of the members of the Museum staff were directed to the securing of bottom samples and bottom life, the hydrographic work being done by the representatives of the Bureau of Fisheries.



FIG. 69.—Looking out through Gregerie Channel, Danish West Indies, where much dredging was done.

The results of these two cruises indicate a remarkable scarcity of animal life, the washing of an entire dredge haul frequently yielding only a handful of shells, worms, and small crustaceans. The bottom material consisted chiefly of mud in a semi-fluid condition, which appears to be discouraging to animal life. A few notable exceptions were encountered in what one might term garden spots in which a decided concentration of living organisms was encountered. No shore collecting was done.

EXPEDITION TO ST. THOMAS, DANISH WEST INDIES

Mr. C. R. Shoemaker of the division of marine invertebrates, spent the two months from the middle of June to the Middle of August,



FIG. 70.—Collecting in Morning Star Bay, Danish West Indies.



FIG. 71.—Edge of Water Island, Danish West Indies, where much shore collecting was done.

1915, in the Danish West Indies, under the auspices of the Carnegie Institution of Washington, D. C., securing collections of corals and other marine invertebrates.

The collecting was done in the open water, bays, and channels at St. Thomas, St. John, and St. James. The deeper waters were explored by means of dredging from a motor boat, while native divers, working from the heavy West Indian row boats, were used for collecting in the shallow waters. In addition to this, much shore



FIG. 72.—Drift Bay, Danish West Indies, where many fine corals and sponges were collected.

collecting was done. Owing to the very strong and constant trade wind, work on the exposed reefs was in many cases made impossible by the heavy surf. Collecting in the protected bays, however, was most successful, as a great variety of bottom was to be found in many of them.

While the chief aim of the expedition was to secure as complete a representation of the coral fauna as possible—and this aim met with considerable success—fine collections of other marine invertebrates were also obtained, including protozoa, sponges, hydroids, medusæ, alcyonarians, anemones, bryozoans, starfish, sea urchins,

holothurians, annelids, crustaceans, mollusks, and ascidians. Collections were also made on land whenever opportunities offered, including insects, mollusks, reptiles, and batrachians.

This expedition has enriched the collections of the National Museum by about five thousand specimens, which it is hoped will throw considerable light on the correlation of these islands in the West Indian complex.

CACTUS INVESTIGATIONS IN BRAZIL AND ARGENTINA

Dr. J. N. Rose, associate in botany, U. S. National Museum, (at present connected with the Carnegie Institution of Washington in the preparation of a monograph of the Cactaceae of America), accompanied by Mr. Paul G. Russell, of the U. S. National Museum, continued the botanical exploration of South America during the summer of 1915, spending over five months in travel and field work in Brazil and Argentina.

Bahia, Brazil, was the first place visited, which city served as a base for collecting trips into the interior of the State of Bahia. One of these was to the town of Joazeiro, located about three hundred miles north northwest of Bahia, and lying in a typical cactus desert, although this region is traversed by the large Rio São Francisco. Notwithstanding the fact that this stream is full the entire year, little or no attempt is being made to use the water for irrigation purposes. The country is of that type known as "catinga," and resembles in a remarkable way the deserts of the West Indies; indeed, the genera of plants are in many cases the same, though the species are distinct. Here was seen the "carnuba," or wax palm, from which is obtained the wax utilized in making records for phonographs. Near Joazeiro is the Horto Florestal, or "forest garden," a government experiment station in charge of Dr. Leo Zehntner, who rendered great assistance in the study and collection of the cactuses of the region.

After making short stops at various stations in returning to Bahia, a trip was made to Machado Portella, a small town about 175 miles west and a little south of Bahia, the terminus of a little narrow gauge railway. This is also a semiarid region, and proved exceedingly interesting botanically. The next side trip was to Toca da Onça, still farther south, on the edge of a thick tropical forest, and in a region much more humid than the northern part of the state.

About six weeks were then spent in beautiful Rio de Janeiro and vicinity. Here, even in the city itself, a botanist finds a great deal to interest him, for the trees are covered with epiphytic cactuses,

mostly of the genus *Rhipsalis*, and within the city itself rises the picturesque Corcovado, a thickly wooded mountain on whose slopes are found many rare ferns and tree-inhabiting cactuses. The Jardim Botânico in this city is one of the finest in the world. Over



FIG. 73.—*Cereus jamacaru* DC., near Joazeiro, Brazil, one of the largest cacti in the State of Bahia, Brazil. Photograph by Russell.

two hundred species of palms from all parts of the tropics are here grown in the open, besides many other rare tropical plants. In another section of the city, in a fine large park called the Quinta Boa Vista, is the Museo Nacional, where a number of rare cactuses were found in the herbarium.



FIG. 74.—Transportation on the Rio São Francisco near Joazeiro, Brazil.
Photograph by Russell.



FIG. 75.—Slopes of Mount Itatiaya, the highest mountain in Brazil, showing *Araucaria brasiliana* A. Rich., in the foreground. In the distance the morning mists hide the valley. Photograph by Russell.

From Rio de Janeiro an ascent of Itatiaya, the highest mountain in Brazil, was made, and on the very top, 10,000 feet above the sea,



FIG. 76.—The wax palm, in the State of Bahia, Brazil, from which is obtained "carnauba," the wax used in the manufacture of phonographic records. Photograph by Russell.

was found a small cactus with beautiful rose colored flowers. Excursions were also made to Cabo Frio, to Ilha Grande, and to the islands in the Bay of Rio de Janeiro. A few days were spent in



FIG. 77.—The avenue of palms in the Botanical Garden at Rio de Janeiro, Brazil. Photograph by Russell.

the Organ Mountains, near Petropolis, the summer home of the wealthiest classes of Rio de Janeiro. This range of mountains merits a more thorough biological exploration than has been hitherto undertaken.



FIG. 78.—*Cercus Forbesii* Först., from the desert region near Cordova, Argentina. Photograph by Russell.

Proceeding southward, a day was spent at Santos, Brazil, the world's greatest coffee center. Buenos Aires was visited next, although but little time was spent in the city. Several visits were

made to the fine suburb of La Plata, where resides Dr. Carlos Spegazzini, the leading authority on Argentine cactuses.

From Buenos Aires a trip was taken across Argentina to Mendoza, a city situated near the foot of the Andes, in a region favorable to the growth of succulent plants. From there a short excursion was made to Portrerillos, Argentina, on the railway which leads to Valparaiso, Chile. Many very interesting plants were found in both these places.

In the city of Cordova, Argentina, northwest of Buenos Aires, the cactus collection of Dr. Frederick Kurtz was found to contain some rare types, which were very kindly submitted for examination and study. In this vicinity, as well as in the neighboring town of Cosquin, many cactuses were collected on the semiarid peneplain.

In addition to good sized collections of cactuses, consisting of living, herbarium, and formalin specimens, moderately large collections of insects, shells, diatoms, and other natural history specimens were obtained. In all about 8,000 herbarium specimens were obtained and over 90 cases, large and small, of living plants were sent back to the United States. The living collection is now on exhibition at the New York Botanical Garden.

The expenses of this expedition were chiefly borne by the Carnegie Institution of Washington and the New York Botanical Garden.

SHELL MOUNDS ON THE PACIFIC COAST

While serving as representative in charge of the exhibit of the Institution at the Panama-Pacific International Exposition, Dr. Walter Hough had an opportunity to examine some of the shell mounds which are numerous around San Francisco Bay. In this work he was aided by Prof. T. T. Waterman and Mr. E. W. Gifford of the University of California. A large mound in West Berkeley which had been sectioned by grading for factory sites, leaving a mass which appeared to be the central portion, and presenting a face 12 feet in height, was selected for operations and enough work was done to secure data as to its strata of accumulation, human, animal, and art contents. Within three feet of the base under ashes were found the skeletons of several infants. This find was considered noteworthy, a similar deposit not having been found before. Artifacts were not common in this section of the mound. There were found plummets, sinkers, hammers, grinding stones, awls, antler wedges, and rarely obsidian blades.

ARCHEOLOGICAL RECONNOISSANCE IN WESTERN UTAH

Previous to June, 1915, our meager knowledge of the archeological remains in western Utah had been gleaned mostly from casual notes in the official reports of early government geologists, surveyors, and army officers attached to frontier posts. Very few scientific excavations had been attempted and almost nothing had appeared in print regarding their results. The cultural relationship between the builders of the ancient Utah dwellings, remains of which consisted primarily of mounds, and the prehistoric pueblos and cliff-dwellings of southeastern Utah and the adjoining sections of Colorado, New



FIG. 79.—Small storage bins in rectangular adobe dwellings at Beaver City, Utah.

Mexico and Arizona, furnished a much mooted question, a solution of which seemed highly desirable. The preliminary task of securing definite and first-hand information regarding these mounds was commenced in May, 1915, by Mr. Neil M. Judd, of the National Museum, who, under the auspices of the Bureau of American Ethnology, remained in Utah six weeks, engaged in researches that extended the entire length of the state.

Mr. Judd began his reconnoissance at Willard, on the northeastern shore of Great Salt Lake. Years of continued soil cultivation had quite leveled the dozen or more mounds once noted at this place; only one remained in the spring of 1915 in a comparatively undisturbed condition. Excavations in this mound disclosed the remains

of a very primitive structure, the roof of which had consisted, apparently, of logs that rested upon the ground and leaned against crosspieces supported by four vertical posts surrounding the fireplace. The adjacent timbers composing the roof had in turn supported layers, respectively, of willows, grass, and clay. This structure had been circular in form and was probably not more than 15 or 16 feet in diameter.

Dwellings of the same type were discovered near Beaver City, in Beaver County, in close proximity to larger structures whose walls were made of adobe and whose flat roofs had consisted of heavy



FIG. 80.—Walls and fireplace of a large adobe structure at Beaver City, Utah.

beams covered with willows, grass, and clay in succession. The artifacts recovered from these two types of dwellings differ but little and indicate a close relationship, both in time and in culture, between their respective builders.

One large mound at Beaver City, which was completely excavated, contained 15 rectangular rooms and a circular structure which has been identified as a kiva or ceremonial chamber similar to those associated with prehistoric habitations throughout the San Juan drainage. Of the 15 rectangular rooms, only four were contiguous: the walls of all had been constructed of adobe mud, pressed into place while in a plastic condition. No indication of the use of adobe bricks or of large adobe blocks could be found. In the northern portion of the mound four distinct levels of occupancy



FIG. 81.—Petroglyphs near the southern end of Little Salt Lake in Iron County, Utah.

were exposed, each bearing fireplaces and other remains of habitations. Careful examination of the artifacts from these superimposed levels failed, however, to show that their inhabitants were other than those who had occupied the lower houses or that any considerable period of time had elapsed between the occupancy of the lowest and the uppermost levels.

Similar dwellings were unearthed near Paragonah, in Iron County. Owing to lack of time no effort was made to study the houses concealed by the larger mounds; the four small elevations examined contained only individual rooms which differed but little from those



FIG. 82.—Small cliff-village in Cottonwood Canyon, near Kanab, Utah.

near Beaver City. Twenty years ago more than 100 mounds were counted at this place; today, only a few remain, the others having been recently razed and the artifacts they contained scattered over the newly plowed fields. While it is impossible to check this destruction, since the mounds are upon privately owned land, it is not yet too late to determine the architectural peculiarities of the primitive houses over which the mounds have accumulated and to gauge the degree of culture to which the ancient inhabitants had attained.

One day was spent near St. George, in the southwestern corner of the State, a region which received much attention from Dr. Edward Palmer, of the National Museum, between the years 1870 and 1876. The vast increase in the number of cultivated acres has brought about the destruction of most of the formerly abundant archeological remains, only a few small and isolated house sites being now visible.

Few ruins were noted along the road that connects St. George with Kanab, in Kane County. This section is extremely arid and no effort was made to visit the isolated mounds and cliff-houses reported by



FIG. 83.—Caves in limestone formation in Whalen Canyon, showing evidence of occupancy by primitive peoples.

cowboys as existing upon the mesas both north and south of Short Creek. It is believed that close examination will disclose structures similar to those near Beaver City and Paragonah, but probably con-

structed with stone instead of adobe—the availability of laminate sandstone would naturally have led to its use by primitive peoples.

After leaving Kanab, Mr. Judd spent one day in Cottonwood



FIG. 84.—Pits and fractured stone at the so-called “Spanish diggings” in Wyoming.



FIG. 85.—Fractured stone surrounding the aboriginal quarries known as the “Spanish diggings” in Wyoming.

Canyon, investigating a number of caves which contain evidences of prehistoric occupancy. In one of these were several circular rooms, the walls of which had been constructed with masses of

adobe, reenforced by bunches of rabbit-brush or the young twigs of sage. On the rear wall of this same cave were many representations of mythological beings, painted in red, white, brown, and yellow.

Another cave in this canyon contained the ruins of four unconnected cliff-houses and a subterranean kiva measuring 14 feet in diameter. The fact that the four houses of this small cliff-village were entirely detached is quite novel and may lead to extensive revision in prevailing theories regarding the origin of the great communal houses built by prehistoric peoples south and east of the Rio Colorado.

Several caves in Cave Canyon are now flooded with water, but bear unmistakable evidence of having been formerly occupied by



FIG. 86.—Tipi circles or old camp-sites on the hills overlooking Willow Creek, Wyoming.

primitive peoples. Exposed mounds in Johnson Canyon, about 15 miles east of Kanab, indicate the sites of rectangular dwellings similar to those near Beaver City, with the exception that stone was freely employed in the construction of the walls.

Mr. Judd's preliminary examination of the archeological remains in western Utah shows that at least three distinct types of prehistoric habitations formerly existed; that artifacts found in the two types first mentioned indicate a close cultural affinity between their builders, and that the second and third types possess many characteristics in common, together with an unmistakable cultural relationship with the pre-Puebloan ruins scattered widely throughout the southwest.

After leaving Salt Lake City on his return journey to Washington, Mr. Judd made a hurried visit to the "Spanish Diggings," a series

of aboriginal quarries on the Dry Muddy, a branch of Willow Creek, in northern Platte County, Wyoming. These pits take their name from a local belief, still prevailing, which credits the Spanish conquerors with having made the excavations in their untiring search for gold. Although but one day was spent in the Willow Creek basin, it is quite evident that the "Spanish Diggings" are nothing more than pits left by the aboriginal inhabitants of the region in their efforts to obtain suitable stone from which arrow-points, blades, and other chipped artifacts might be made. Most of the quarries are in exposures of fine-grained, bluish quartzite and may be traced over an area nearly 50 miles square. In every valley and upon almost all the low hills which divide the stream courses are countless tipi circles, the former camp sites of wandering bands of Indians, in and about which are innumerable chipped scrapers, blades, etc., and vast quantities of artifacts rejected during the manufacturing process, all of stone quarried from such exposed rock masses as the "Spanish Diggings."

TRIP TO THE CHIPPEWA INDIANS OF MINNESOTA

In May of 1915, Dr. Aleš Hrdlička, curator of the division of physical anthropology in the U. S. National Museum, made a rapid but rather extended trip over the White Earth and Leech Lake Reservations in Minnesota, under the auspices of the Department of Justice.

The object of this trip was to determine, as far as possible, the extent of full-bloods and mixed-bloods in the tribe, and especially to pass on the status in this respect of certain families and individuals.

About five years ago the United States Congress passed a law enabling mixed-blood Indians to alienate their land and timber, but did not sufficiently define what constituted a mixed-blood, that is, how he could be safely recognized as such in every instance before the law. As soon as this law was passed the local lumber companies and white settlers took full advantage of the situation, with the result that in a few years hundreds of Indian families and individuals were practically destitute, and those who were induced to sell included not only the easily recognizable mixed-bloods, but also quite a number of those who claimed to be full-bloods, or who could not by any ordinary means be recognized as having any white blood in their veins. Moreover, in some of these cases the sale of the timber or land by the Indians was obtained by misrepresentation and even by actual fraud.

The full-blood Indians, however, and those who could not be legitimately recognized as mixed-bloods, were under the protection of the United States Government. They had no right or power to alienate their property without the Government's consent; and when the attention of the authorities was called to the wholesale deprivation of the Indian of his land and timber, due steps were taken not



FIG. 87.—Chippewa mixed-blood, French-Indian, looking strikingly like a Japanese.

only to prevent the continuation of such deprivation but to recover for the Indian all property that was taken from him illegally. Commissions were appointed to investigate the conditions; the Indians were thoroughly questioned as to their genealogy and blood mixture, and in the course of years hundreds of actions were brought before the courts for the recovery of their property.

As these cases proceeded and the defense developed, it became evident that the most urgent and important problem was to deter-

mine in many of the contested cases who was, and who was not, a full-blood Indian. There was no difficulty in this respect where the amount of white blood was considerable or the mixture fairly recent; but in many instances the mixture first took place many generations ago, and the proportion of white blood in the present representatives of some such families is so small that it is difficult, if not impossible, to determine the degree of white infusion by ordinary observation.

It was with a view of assisting, as far as possible, in the solving of the problem as to who are full-bloods and who are mixed-bloods among the Chippewa, that Dr. Hrdlička was asked to visit the reservations; and he undertook the task with the expectation of coming in



FIG. 88.—A family of Chippewa mixed-bloods, Leech Lake. All the individuals are mixed, but in some the proportion of white blood is small.

contact with many interesting conditions which usually are not directly related to regular anthropological work.

The method of procedure was to drive from dwelling to dwelling over the reservations, and to examine the Indians whose blood status was in doubt by all the means at the disposal of the anthropologist, practicable in field work of this nature. Particular attention was directed to the skin of the body, especially that of the chest, to the hair and eyes, physiognomy, and a number of other features, such as the nails, gums, and teeth, which may be of assistance in determinations of this nature. Furthermore, stress was laid on the examination, in all important cases, of all the living members of the family, for it frequently happens that the brothers and sisters of an individual

throw more light on his blood status than does the examination of his own person.

The results of the work need be mentioned in this place only very briefly. It was found that mixture is very prevalent in the tribe. Most of this mixture dates far back, and taking in account the effects of the changed mode of living of the Indians, which has resulted in some lightening of the skin, it is frequently difficult to determine; yet it was found that there are certain signs by which in a large majority of cases a quite definite judgment can be reached on this question. The most difficult cases were found to be the old people, in whom the hair has changed to some extent through age and neglect, the skin is modified by exposure, the teeth are lacking



FIG. 89.—Chippewa birch-bark lodge, White Earth Reservation. These lodges, the shape of which reminds one so much of the Mongolian and Siberian "yurtas," are now very scarce among the White Earth Chippewa.

or worn down, and the eyes, due to various affections as well as age, are in a more or less unsatisfactory condition for examination.

On the whole there is no question but that a detailed anthropological examination in cases of this nature could be of considerable assistance to the law. It would readily show the true full-bloods, with a very large majority of the mixed-bloods; and the small percentage then remaining would consist almost exclusively of aged individuals whose status could probably be readily adjusted to legal requirements by some sort of compromise.

Scientific results of the work, on the other hand, would probably prove disappointing. The obtainable knowledge as to the nature and time of the admixture is very limited; the members of the families

are widely scattered; conditions are complicated by former polygamy; and there are many blends which doubtless follow some laws of heredity, but the complexity is too great to be unraveled by such investigations as are possible on the great and sparsely populated reservation, and with people who, due to their limitations, can be of but little assistance to the anthropologist.

THE NACOOCHEE MOUND IN GEORGIA

In pursuance of a plan for cooperative archeological research by the Bureau of American Ethnology and the Museum of the American Indian of New York, Mr. F. W. Hodge, Ethnologist-in-charge, early in July joined Mr. George G. Heye of the museum mentioned, in the excavation of the Nacoochee Mound in White County, north-eastern Georgia, permission to investigate which was accorded by the owner, Dr. L. G. Hardman.

The Nacoochee Mound is an earthwork built by the Cherokee Indians, who occupied it until early in the 19th century. The name "Nacoochee," however, is not of Cherokee origin, or at least it is not identifiable by the Cherokees as belonging to their language, and by no means does the word signify "the evening star" in any Indian tongue, as one writer has claimed.

The summit of the mound, which had been leveled for cultivation about 30 years ago, measured 83 feet in maximum and about 67 feet in minimum diameter; the height of the mound above the adjacent field was 17 feet, 3 inches, and the circumference of the base 410 feet. These measurements, however, are doubtless less than they were at the time the mound was abandoned by the Cherokee, as all the dimensions have been more or less reduced by cultivation, the slope at the base particularly having been plowed away for several feet.

It was the custom of the Indian tribes of the South, and especially throughout the valleys of the Mississippi and its tributaries, to erect mounds for various purposes, namely, to serve as a site for the domicile of the chief or for the "town-house" of the settlement, as a burial place of the dead, or merely as a place of refuge during periods of flood. The Nacoochee Mound was reared both for domicile and for cemetery purposes, and was composed of rich alluvial soil from the surrounding field. The excavations determined that the mound was not built at one time, but evidently at different periods as circumstances demanded. This was shown plainly by the stratification of the mound soil, the occurrence of graves at different depths with undisturbed earth above them, the presence of fire-pits



FIG. 90.—The Nacoochee Mound from the south. The summer-house on the summit was erected about 30 years ago.



FIG. 91.—Forty-foot trench, 4-foot level. View looking north.

or of evidences of fires throughout the mound at varying levels, and by the finding of a few objects derived from the white man in the upper part and in the slopes of the mound, but not in the lower levels. From this last observation it is evident that the occupancy of the mound extended well into the historical period, a fact supported by the memory of the grandparents of present residents of the Nacoochee Valley who recalled the mound when the Cherokee Indians still occupied it and the surrounding area.



FIG. 92.—Trench, east side of mound. View from the south. The lowermost part of the excavation shows the base of the mound.

The fact that the mound was used for burial purposes is attested by the finding of the remains of 75 individuals during the course of the excavations, the graves occurring from slightly beneath the summit to a depth of about 19 feet, or below the original base of the mound. These graves, with few exceptions, were unmarked, and in most instances were not accompanied with objects of ceremony or utility. The exceptions were those remains with which were buried stone implements, shells or shell ornaments, a smoking pipe, a pottery vessel, or the like. The skeletons were found usually with the head pointed in an eastwardly direction, and were all in such a greatly decomposed condition that it was impossible to preserve any of them

for measurement and study, the bones in most cases consisting of only a pasty mass.

As mentioned above, most of the burials were unmarked. The exceptions consisted of two graves encased and covered with slabs of stone, both unearthed near the very base of the mound. One of these stone graves contained a skeleton the bones of which were largely of the consistency of corn-meal, owing to the ravages of insects; but what was lacking in the remains themselves was more than compensated by the finding, near the skull, of a beautiful effigy



FIG. 93.—Sectional view of fire-pit 10 feet in length, showing indurated ash.

vase of painted pottery, the only piece of painted ware, whole or fragmentary, found in the entire mound. The occurrence of this type of vessel and the presence of the stone graves at the bottom of the mound suggest the possible occupancy of the site by Indians before the settlement of the Cherokee in the Nacoochee Valley.

Perhaps the most remarkable feature of the mound was the large number of smoking pipes of pottery, mostly broken, but in many forms and of varying degrees of workmanship. Some of the pipes are of excellent texture and are highly ornamented with conventionalized figures of birds, etc., or marked with incised designs. Another feature of the mound was the great amount of broken pottery found, especially in the refuse at the base and covering the slopes.

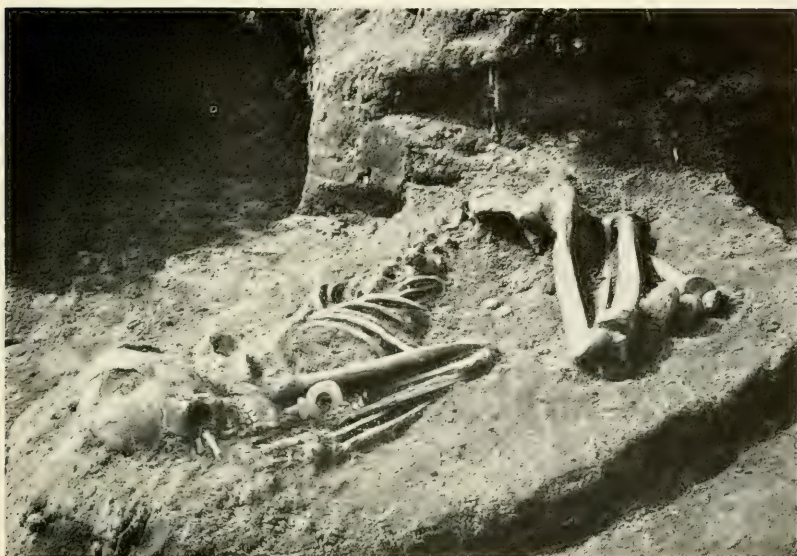


FIG. 94.—A flexed skeleton in the Nacoochee Mound, showing ornaments buried therewith.

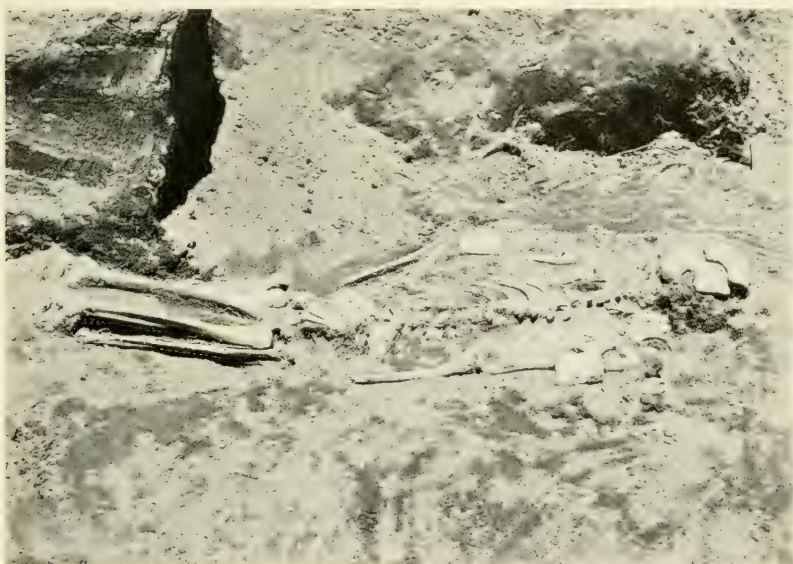


FIG. 95.—One of the burials found in the Nacoochee Mound. Note the copper arm-band, and the beads at the neck.

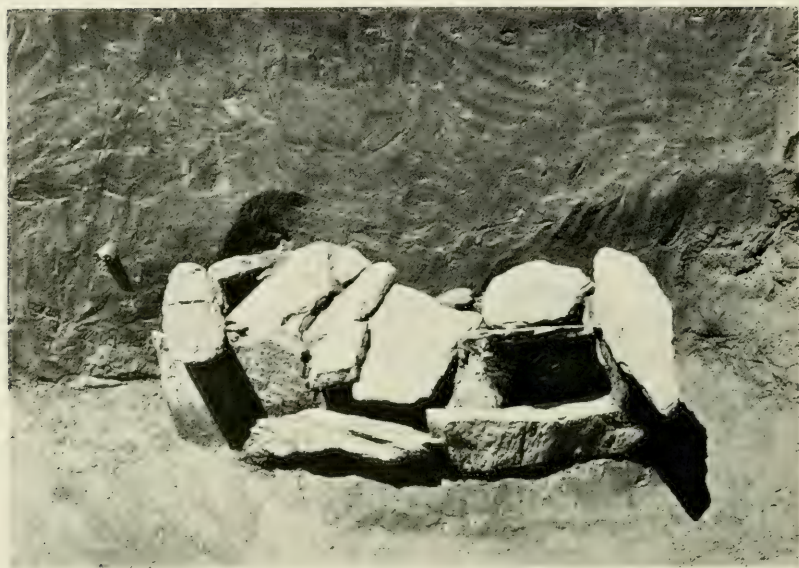


FIG. 96.—Stone grave above the bottom of the mound.

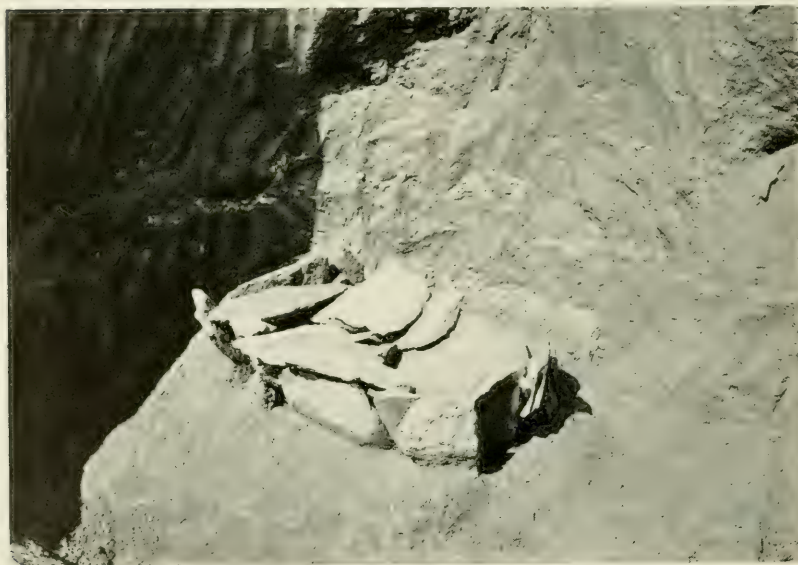


FIG. 97.—Stone grave near the bottom of the mound.



FIG. 98.—Painted effigy vase found with a skeleton in a stone grave at the base of the mound.

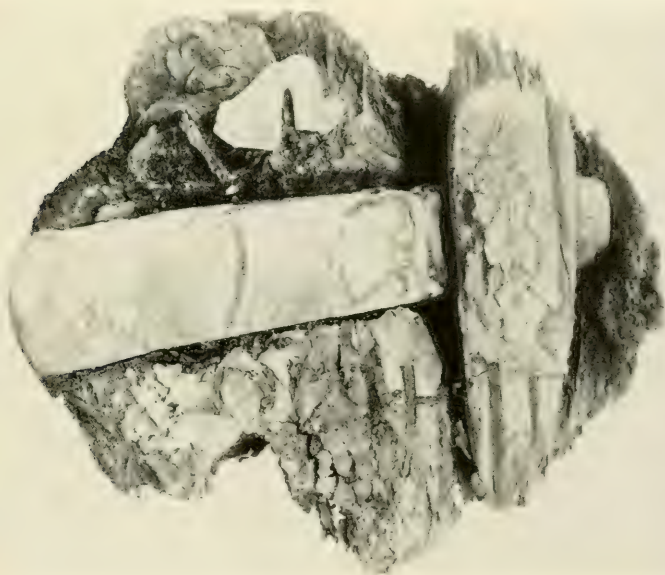


FIG. 99.—Copper axe in handle found with one of the burials at the base of the mound.

This pottery is chiefly of fine texture, although some of the cooking vessels are of coarse ware. With the exception of the painted vessel above noted, the only ornamentation applied by the makers of the pottery consists of incised and impressed designs, the latter conferred usually with a paddle of clay or wood, or worked out in the moist ware, before firing, by means of a pointed tool, a spatula, a piece of cane, or a shell.

PREHISTORIC REMAINS IN ARIZONA, NEW MEXICO, AND COLORADO

One of the most interesting historical monuments protected by the Government is the ruin of the old mission church of San José de



FIG. 100.—Ruin of San José de Tumacacori, Arizona.
Photograph by Fewkes.

Tumacacori, situated on the Santa Cruz River, south of Tucson, Arizona. There were formerly several of these churches along the banks of this river, one of which, the nearest to Tucson, is called San Xavier del Bac. This building is still in use, having been repaired and enlarged to accommodate the inhabitants of the neighboring village of Papago Indians. A few miles south of San Xavier are remains of the old settlement Tubac, and the walls of the fort and former Indian town. Still farther south, about 20 miles from Tucson, stand Tumacacori (fig. 100) and the mounds of the adjacent prehistoric settlements. Although the old church is protected from vandalism, the foundations of the walls, undermined and exposed to

the elements, are sadly in need of repair. Unless something is done to prevent its crumbling walls from falling, after a few years little will remain of this fine example of Spanish mission architecture of the 18th century. The façade and dome are still fairly well preserved; the main walls, roof of the cupola, and mortuary chapel are still standing, and a few hundred dollars judiciously expended would save for posterity this precious relic of the past. Evidences of the walls of a prehistoric compound formerly inhabited by the Indians of that region may be traced near the mission and mounds indicating massive aboriginal buildings are visible. These ought to be excavated and repaired. Dr. Fewkes made a trip to the above mentioned missions in January, 1915, in order to study the distribution of prehistoric settlements now in ruins on the Santa Cruz, one of the gateways

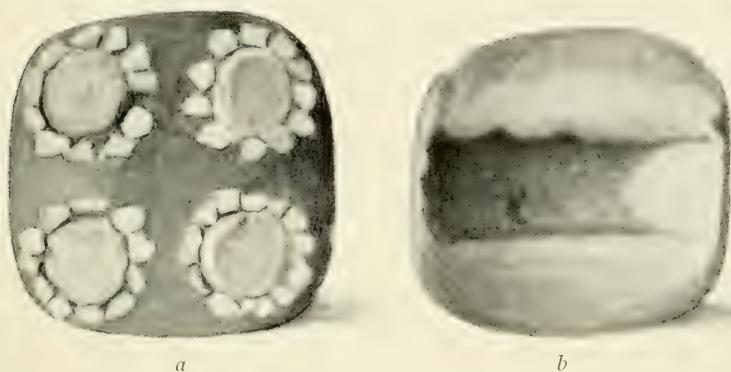


FIG. 101.—Turquoise mosaic (*a*, front; *b*, back) from Mimbres Valley, New Mexico. Original 0.8 inch square. Heye Collection. Drawing by Mrs. R. E. Gamble.

of early communication between Mexico and southern Arizona. He regards the region west of the Santa Cruz as one of the most important unworked ethnological and archeological fields in the Southwest. Little has been recorded on the prehistoric remains in this region and there is still much to be learned of the modern inhabitants whose culture has been little modified by the influence of civilization and who still preserve many of their ancient dances and secular customs.

The slightly known ruins of this region were found to be of practically the same type as Casa Grande on the Gila, suggesting a southern extension of this type of architecture into Mexico. The prehistoric mounds would well repay systematic excavation, and

would yield much material bearing on the diffusion of culture of the ancient people of our Southwest. The object of the visit was a reconnoissance, which was successfully completed. There are large mounds indicating compounds of considerable size between Casa Grande and Vekol, near Quijotoa, and at the Kwahadt settlements.

Having made the brief reconnoissance above mentioned, Dr. Fewkes returned to Deming, New Mexico, and undertook an examination of ruins along the Mimbres River, inspecting various archeological sites as far north as Silver City. He obtained by purchase valuable additions to collections of the characteristic pottery of this



FIG. 102.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, unidentified animal; *b*, bee; *c*, *d*, unidentified composite animals.

region, from Oldtown and elsewhere (figs. 102-111). One of the most striking objects examined is a rare turquoise mosaic with four figures representing flowers (fig. 101). The culture of the Mimbres Valley as shown by archeological data is distinctive, with no likeness to that of the lower Gila, but connecting that of the upper Gila with Casa Grandes in Chihuahua. The prehistoric culture of Mimbres Valley, like that of the Santa Cruz, is destined to play an important rôle in determining diffusion of Southwestern culture.

Important work was carried on by Dr. Fewkes during the last year in the Mesa Verde National Park, where the Department of the Interior is cooperating with the Smithsonian Institution in the excavation and repair of cliff-houses and other prehistoric ruins, to increase



FIG. 103.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, bird;
b, turtle; *c*, bear; *d*, reptile.



FIG. 104.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, un-
identified animal holding unknown object (see *b*, fig. 107); *b*, bear.

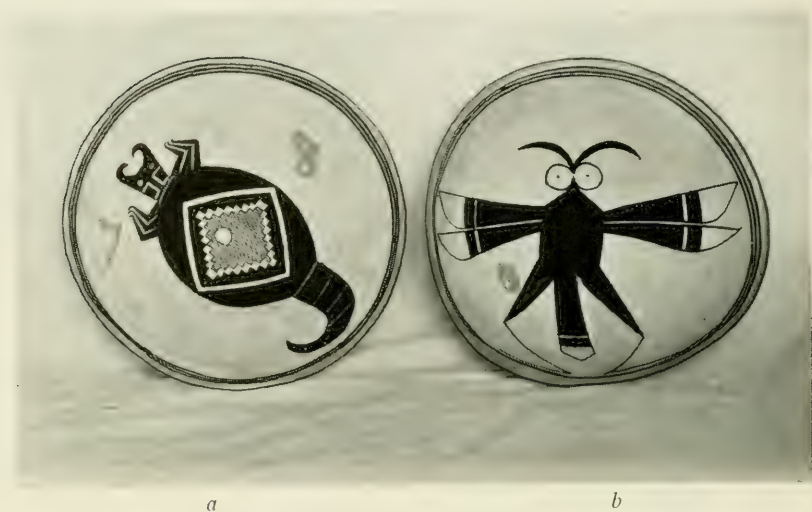


FIG. 105.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, unidentified insect; *b*, dragonfly.

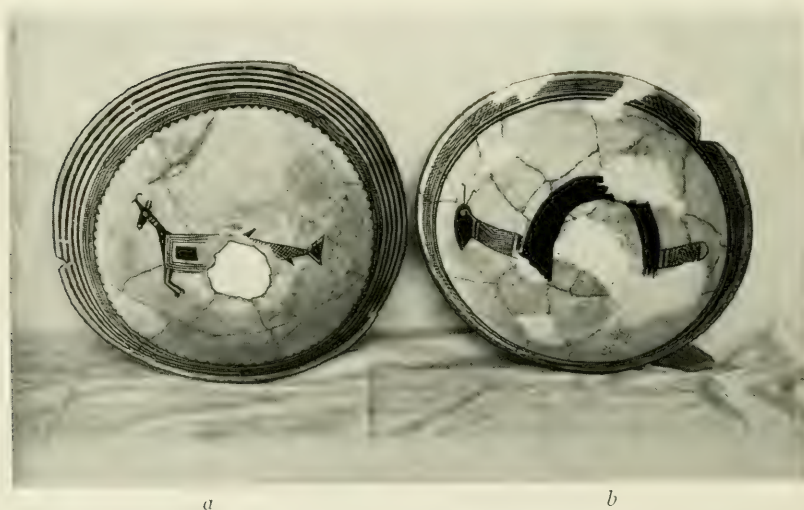


FIG. 106.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, animal with head and body of antelope and tail of fish; *b*, measuring-worm, with rainbow symbol.

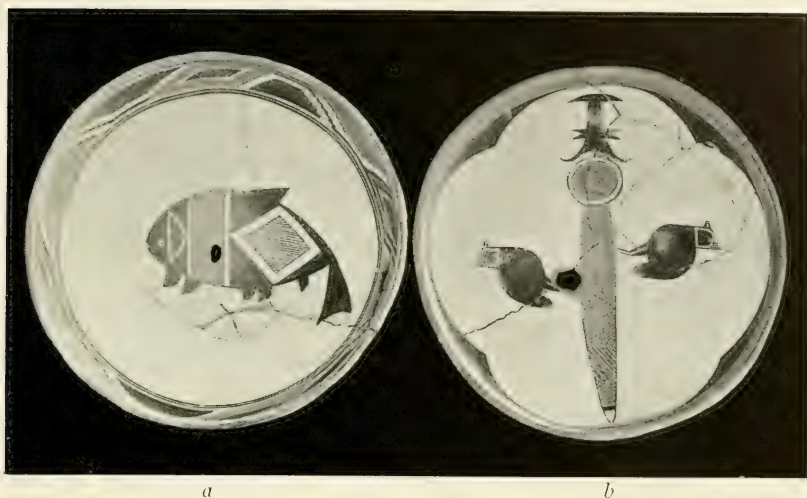


FIG. 107.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, fish; *b*, birds on unidentified object (see *a*, fig. 104).



FIG. 108.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, bird; *b*, frog; *c*, mountain sheep; *d*, fish.

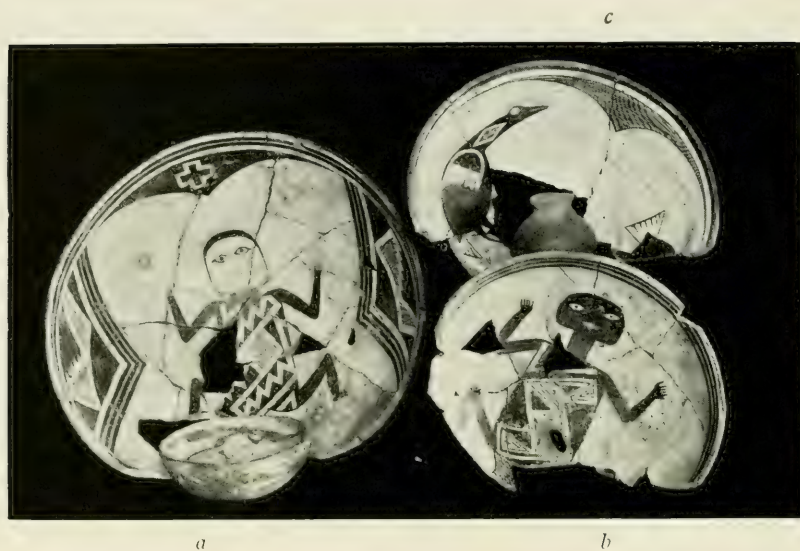


FIG. 109.—Decorated pottery from Mimbres Valley, Heye Collection. *a* and *b*, dancing figures; *c*, bird.



FIG. 110.—Decorated pottery from Mimbres Valley, Heye Collection. *a*, animal with head of antelope and body of insect; *b*, mountain lion.

their value to students and render them more attractive to visitors. The field work last summer (1915) was devoted to a large building situated on the point (fig. 112) opposite Cliff Palace, and to Oak-tree House, an adjacent cliff-dwelling in the neighboring canyon. This work was unusually successful in that it revealed a new type of prehistoric building 121.7 feet long by 340 around the north or semi-circular side. This ruin, to which the name Sun Temple has been given, is considered one of the most mysterious structures in the



FIG. 111.—Bird and larval insect from Mimbres Valley, Heye Collection.

Southwest. It was completely excavated, the fallen earth and stones were removed, and the walls thoroughly repaired, the most improved methods being adopted for their preservation from the elements. The ground plan shows an original building and an annex, shaped like a capital letter **D**. Adjoining the southwest corner of the annex, on the outside, were built two walls forming an enclosure identified as a shrine, the floor of which is formed by the upper face of the southwest cornerstone of the building. In this floor is a fossil palm, suggesting a symbol of the sun, which has given the name to the ruin.

The mound (fig. 113) covering the ruined walls of the Sun Temple dates back to 1555, as indicated by a cedar tree having 360 annual "rings" which was found growing on the top of the highest wall. There is no way of telling how much earlier the mound was formed or how many years before it became a mound the foundations of the building were laid. It is, however, believed that worship at the sun shrine undoubtedly antedated the construction of the building.



FIG. 112.—Sun Temple from point across Fewkes Canyon, Mesa Verde National Park, Colorado. Photograph by T. G. Lemmon.

The Sun Temple was probably built by the neighboring cliff-dwellers and is regarded as more modern than Cliff Palace. The unity of plan shown in the Sun Temple (fig. 115) indicates union of several clans in its construction and the existence of a higher social organization than at Cliff Palace. It was intended for a ceremonial building with a secondary purpose of storage and refuge in time of trouble, but shows evidence that it was never finished.

A cliff-ruin called by guides Willow House, but which might better be known as Oak-tree House, is a typical cliff-dwelling of about the same age and culture as Cliff Palace. It is situated in

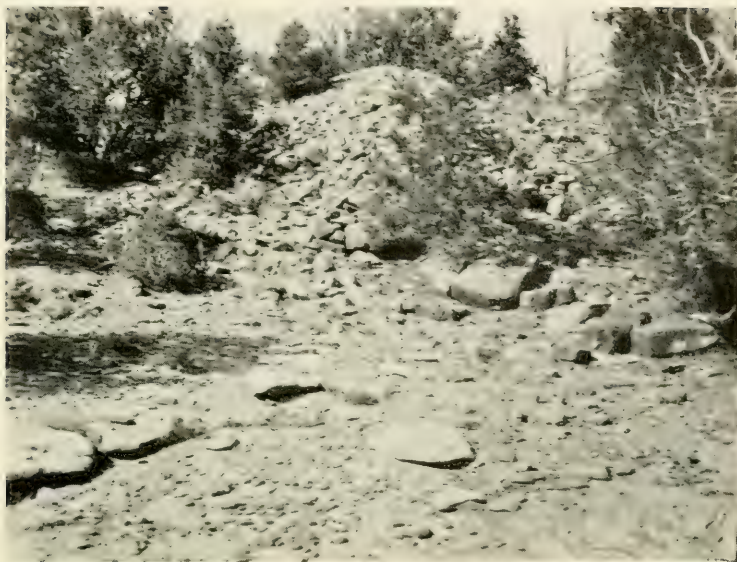


FIG. 113.—Sun Temple, Mesa Verde National Park, Colorado, before excavation, from southwest corner. Photograph by E. E. Higley.



FIG. 114.—North wall of Sun Temple, Mesa Verde National Park, Colorado, looking east from annex. Half excavated. Photograph by Fewkes.

Fewkes Canyon, Mesa Verde National Park, under a perfectly arched natural roof, below the mysterious ruin above mentioned. Oak-tree House is not referred to in Nordenskiöld's classic on the "Cliff Dwellers of the Mesa Verde," and has not been figured nor described by other archeologists, although it presents several very exceptional architectural features. This oversight may be due in part to the fact that it was practically inaccessible previous to last summer (1915). Notwithstanding its neglect by archeologists this ruin is of no mean size, having had at least six circular subterranean ceremonial chambers, and 25 rooms, some of which were habitations, indicating the existence of a population of at least six clans. Its ground plan shows that it occupied the whole floor of a large cave; the houses were in places four stories high.

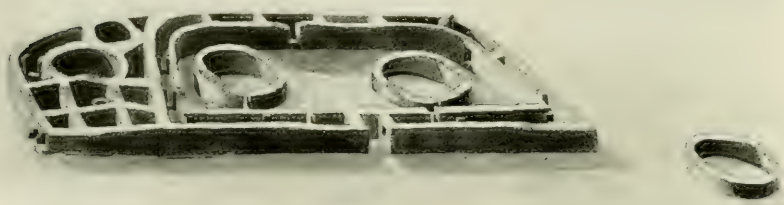


FIG. 115.—Birdseye view of Sun Temple, Mesa Verde National Park, Colorado, looking northeast.

At the close of the work on the Sun Temple, above mentioned, the rooms of Oak-tree House were cleaned out, and the walls repaired and put in condition for permanent preservation. Ladders were placed in position to afford descent from the rim of the mesa to a pathway made on the talus on which it stands. This descent is a somewhat difficult task, but once accomplished it offers beautiful views of Cliff Palace and other ruins down Soda Canyon, as far as Mancos River.

Perhaps the most unusual ceremonial room of Oak-tree House (fig. 117) is a kiva shaped like the letter **D**, in which there is a rectangular chamber between the firehole and the south wall. This chamber communicates with the outside by means of a vertical flue and opens into the main room by two passageways in a wall, corresponding to the deflector of other kivas. Another exceptional feature of Oak-tree House is the presence in the rear of the cave of a circular room,



FIG. 116.—View of Sun Temple, Mesa Verde National Park, Colorado, from the east. Photograph by Fred Jeep, with east wall added by W. H. Holmes.

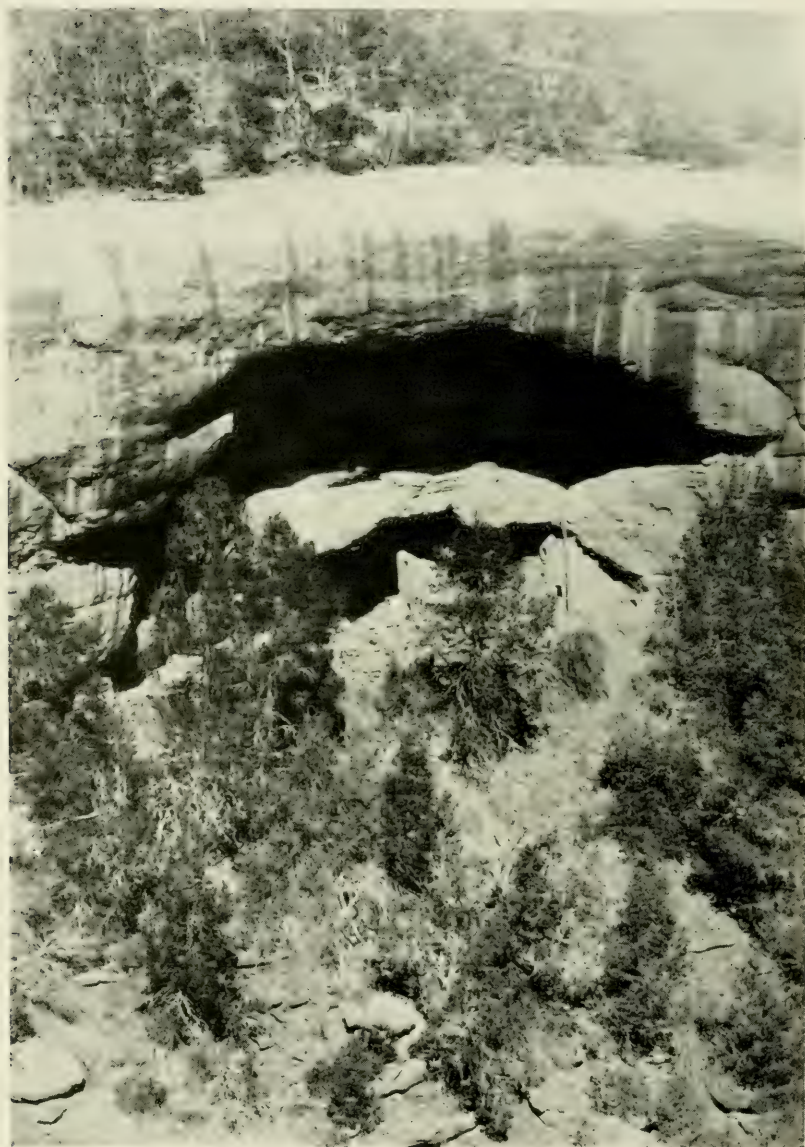


FIG. 117.—Oak-tree House, Mesa Verde National Park, Colorado.
Photograph by T. G. Lemmon.

the walls of which are not constructed of masonry but of willow twigs and sticks covered with adobe plastering, a feature quite common in the cliff-house walls in northern Arizona, but very rare on the Mesa Verde. This is supposed to be a survival of a pre-Puebloan style of architecture. A small collection of artifacts was made in the course of the repair of Oak-tree House. Among the objects found were two beautiful specimens of typical black-and-white-ware pottery. The so-called snow-shoe (fig. 118) is rare, and the head-rest (fig. 119) exceptionally well made.

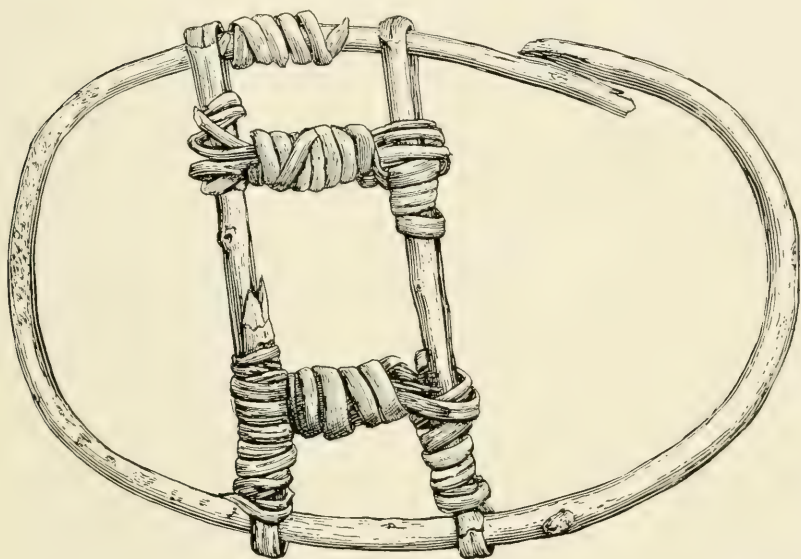


FIG. 118.—“Snow-shoe” from Oak-tree House, Mesa Verde National Park, Colorado.

Following the trail along the north side of the same canyon in which Oak-tree House is situated, the visitor comes to a remarkable ruin called Painted House, which, like Sun Temple on the cliff above, presents a ground plan and architectural features different from any yet described in cliff-dwellings. Like the Sun Temple it appears to have been built for religious ceremonies, but it is quite different in character. Painted House has a long room or court, possibly an open dance plaza or a covered ceremonial room, the north side of which is formed by the vertical cliff of the rear of the cave. At each end of this long room there are rooms with massive walls, that on the east being connected with the court by passage-

ways, too wide for ordinary cliff-house doorways. The walls of one of the rooms of the western group are plastered, and decorated with a procession of animals and men painted in red. Two of the human figures, unfortunately mutilated within the last six years, suggest phallic beings still personated by the Hopi, a similarity which implies that the Mesa Verde cliff-dwellers had a cult like that of the

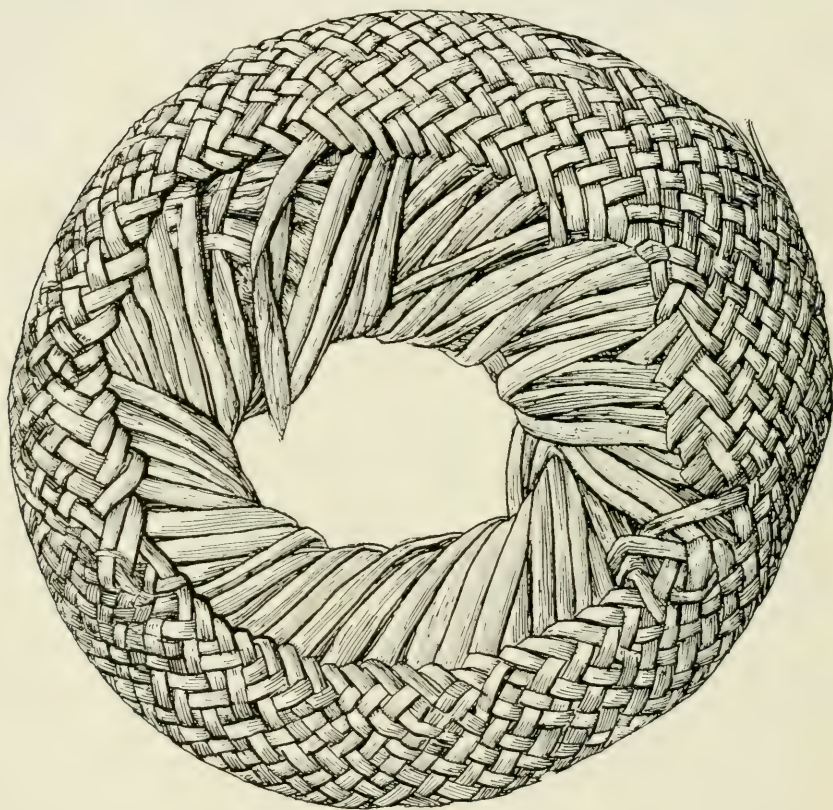


FIG. 119.—Head-rest from Oak-tree House, Mesa Verde National Park, Colorado.

Hopi, and as phallic rites and personages are pre-eminently associated by the latter with New-fire ceremonies, it may be that the cliff-dwellers of Painted House practised the same or similar rites.

The specialization of these two great buildings for ceremonial purposes and the evidences of the former existence of a considerable population nearby, seen in the size of Cliff Palace and other cliff-houses in the neighboring caves, impart peculiar interest to the study

of the distribution of aboriginal culture characteristics of the Mesa Verde National Park.

Information has been brought from time to time to the attention of the Smithsonian Institution that there exists in the northern part of Texas a large ruin known as the Buried City of the Panhandle. The name suggests that this may be a community dwelling, and it has occurred to several students that this "city," if such exists, marks the eastern extension of the Pueblo area. In order to determine the truth of this report Dr. Fewkes visited northwestern Texas and examined certain Indian remains along Wolf Creek, a tributary of the Canadian



FIG. 120.—Sandstone dyke, often mistaken for an artificial wall. Rockwall, Texas.

River, said to be the location of the "city." Sites of aboriginal camping places, probably of nomadic Indians, were found in this locality, but no remains of walls or pottery suggestive of Pueblo occupancy. There are no signs of a "Buried City of the Panhandle" in the region visited.

Archeologists often have their attention called to sand dykes which are locally mistaken for artificial walls. The attention of Dr. Fewkes was directed to what appeared to be a prehistoric artificial wall situated in the suburbs of Rockwall, in Rockwall County, near Dallas, Texas. In order to determine its true character he visited this "wall" and found that it was not constructed by man, but belonged to those natural formations known to geologists as sand dykes. Its resem-

blance to an artificial wall is so close that for many years it was supposed to be the wall of a prehistoric dwelling (see fig. 120).

ETHNOLOGICAL RESEARCHES IN OREGON AND WASHINGTON

During the summer of 1915 Dr. Frachtenberg continued his investigations of the languages, traditions, history, and ethnology of the



FIG. 121.—Louis Kenoyer, the last of the Atfalati.

various tribes of Oregon and Washington. He began the year's work in the month of July with a trip to the Yakima Reservation, Washington, where, with the assistance of Louis Kenoyer, he revised the Atfalati (Kalapuya) manuscript material which had been collected by the late Dr. Gatschet in 1877. This material, comprising 421 manuscript pages, consisted of vocables, stems, grammatical forms, and ethnological and historical narratives, obtained in the Atfalati

dialect. The revision of this material marked the completion of the work on the Calapooya (Kalapuya) languages which Dr. Frachtenberg began during the previous summer. It may not be out of place here to mention the fact that Louis Kenoyer is the last surviving member of the Atfalati (or Wapato Lake) tribe of the Kalapuya family.

During the latter part of August Dr. Frachtenberg attended the



FIG. 122.—Thomas Payne, the present nominal Chief of the Quileute.

first Indian Fair, which was held at Siletz, Oregon, by the various Indian tribes living at that agency. During this trip 52 Athapascan and Shastan songs were collected.

In the month of November Dr. Frachtenberg commenced his ethnological researches of the Chimakuan family. Up to the present writing a preliminary survey of the morphological and syntactic structure of the Quileute language had been made, and 30 native myths and tales were collected.

The Chimakuan family was originally composed of three distinct tribes living in the northwestern part of Washington. These tribes were the Chemakum, Quileute, and Hoh. The Chemakum tribe has disappeared entirely; while the Quileute and Hoh tribes are represented by approximately 350 individuals living at the Lapush Agency, in Clallam County, Washington.



FIG. 123.—A group of Quileute Indians, members of the Shaker Church.

A singular feature of the material life of these Indians, to which attention may be called here in passing, has been observed in the fact that in former days they were actually hunting whales in the ocean instead of eating the meat of whales that drifted ashore. As far as our knowledge goes, the Nootka of Vancouver Island are the only other Indian tribe that ever engaged in the actual hunting of whales in the ocean.

WORK AMONG THE FOX AND SAUK INDIANS

In June, 1915, Dr. Michelson left for the West to resume his work among the Fox Indians of Iowa. He remained at Tama till about the middle of August, where he devoted his time mainly to securing ritualistic origin myths. These myths, particularly those

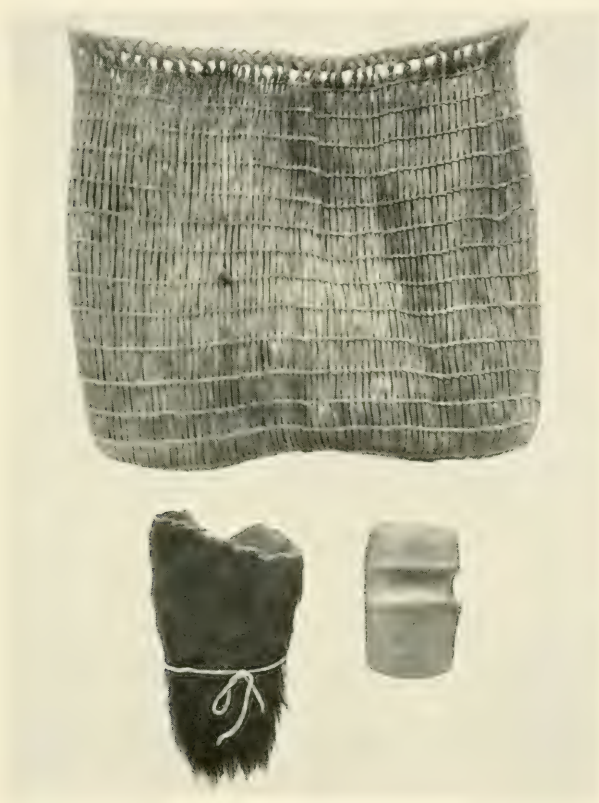


FIG. 124.—Stone ax and wrapping of bear hide, belonging to a sacred pack of the Fox Indians.

appertaining to clan ceremonies, are extremely valuable inasmuch as the existing ceremonies which the myths account for, cannot be witnessed in their entirety. It is clear that these myths were invented long ago to account for the existing ceremonies. In this way is obtained knowledge of one part of Fox ethnology which otherwise would be a blank.

In August Dr. Michelson left for Oklahoma to work among the Sauk and Fox of that state. Here he spent his time mainly in obtaining translations of the myths noted above, as the Fox informants, being extremely conservative, wrote out the myths in the



FIG. 125.—Chief of Fox Indians, Pushitoniqua (Old Eye).

current syllabary with the understanding that these would be translated elsewhere. At the same time the Sauk social organization and the Sauk systems of consanguinity received attention. It appears that the regulations regarding membership in the tribal dual are

quite complex, and it will be some time before the matter can be cleared up. The work on the Sauk system of consanguinity shows that Morgan's Sauk and Fox schedules need revising. Dr. Michelson returned to Washington about November 1.

STUDIES AMONG THE CAYUGA INDIANS

Mr. J. N. B. Hewitt, ethnologist, with the efficient aid of Mrs. Mary Gibson, widow of the late Chief John Arthur Gibson, completed the long text in Cayuga of the O'ki'we, being the history and the ritual of the Feast of the Dead which is in charge of the women of the tribe. With the same assistance Mr. Hewitt also finished work on a selected list of Mohawk verbs by supplying each with a Cayuga synonym. Then with the aid of Mr. Richard Hill he was able to correct and elucidate certain moot points in the Mohawk and other texts of the Ritual of the Mourning and Installation Council, and especially to confirm a conjecture as to the reconstruction of a portion of a ritual which had been quite lost and forgotten, namely, the dramatization of the so-called Six Songs, in which these songs are sung by a chief impersonating the dead chief.

STUDY OF INDIAN MUSIC

The study of Indian music was continued by Miss Frances Densmore during the season of 1915. The first reservation visited was that of Fort Berthold, North Dakota, where she resumed, under the auspices of the Bureau of American Ethnology, a study of music of the Mandan and Hidatsa, commenced in 1912 under the auspices of the State Historical Society of North Dakota. A competent interpreter for each language was secured, and the work was conducted along more intensive lines than during the previous visit.

One of the principal subjects investigated was the custom of eagle-catching, which is common to both tribes and which, though scarcely to be called ceremonial, is closely associated with their beliefs in the power of the supernatural. The Mandan tradition of the origin of this custom, together with the songs connected with its fetish (the wolverene), was obtained from the only man living who inherited them. It is understood that no other person has the right to sing these songs, and the ownership of songs is held inviolate on this reservation. Miss Densmore visited an eagle trap which is said to have been in disuse for about 70 years. Upright in the ground beside it was a bone that had been used to hold bait for the eagles. This bone was identified as one of the upright vertebrae of a buffalo, and on it could be discerned traces of red paint.

The legend of the origin of the flute was also obtained by Miss Densmore, and its melody recorded phonographically. The Society of the Creek Women among the Mandan was also studied, and its



FIG. 126.—Hidatsa whistle played by owner.



FIG. 127.—Old Mandan earth lodge.

songs were recorded by a member of the society. Other distinctively Mandan songs are those connected with the spring-time custom of "purifying the corn," several songs of the last corn priest

being recorded by his daughter. Mandan songs sung by women in their gardens were obtained from two aged women of the tribe, most of them being plaintive songs concerning absent or slain warriors.



FIG. 128.—Modified form of Mandan earth lodge.



FIG. 129.—Entrance to old Mandan earth lodge.

The Hidatsa material, in addition to that pertaining to the custom of eagle-catching, chiefly concerns war and the various societies, many songs of these classes being recorded. The songs of the Mandan

and Hidatsa, on being transcribed, are found to be of a simpler type than those of the Chippewa and Sioux which have been analyzed.

Specimens of the musical instruments collected among both tribes include a drum, the rattles used by certain societies, and a whistle resembling a flageolet but without finger holes, on which a wide range of tones can be played (fig. 126). Specimens illustrating the material culture of the tribes were collected, and photographs illustrating their dwellings and daily occupations were made (figs. 127-130).

A new phase of Miss Densmore's investigations consisted in the making of pitch-discrimination tests. This was done by means of



FIG. 130.—Mandan woman tanning a hide at entrance of earth lodge.

a set of 11 tuning forks, the fundamental fork having a pitch of 435 vibrations (*a* above middle *c*, international pitch), and the remaining forks being tuned respectively, $\frac{1}{2}$, 1, 2, 3, 5, 8, 12, 17, 23, and 30 vibrations higher. These tests were made on both Mandan and Hidatsa Indians and the results recorded.

After leaving the Fort Berthold Reservation Miss Densmore visited the Standing Rock Reservation in North Dakota and the White Earth Reservation in Minnesota for the purpose of making similar tests among the Sioux and the Chippewa. The results of these tests show that some Indians have a pitch discrimination of three vibrations, or one-eighteenth of a tone, while others can discern only an interval of five vibrations, or one-eleventh of a tone. The method used in these tests is that of Prof. C. E. Seashore, of the State Uni-

versity of Iowa, who kindly examined the record of the tests and expressed the opinion that the abilities shown by these Indians are about as good as would be found among average American whites under similar conditions.

OSAGE WAR RITES¹

In the month of March, 1915, additional information was secured by Mr. Francis LaFlesche, ethnologist, from Xu-thá Wa-toⁿ-iⁿ, concerning the Tse-dó-ga Iⁿ-dse gens version of the great Osage war rites. This information consisted mostly of certain parts of the rites arranged in metrical form for the purpose of reciting at the ceremonies. This arrangement is called wi'-gi-e, or a recitation. The wi'-gi-e are as follows:

1. Wi'-gi-e Toⁿ-ga has 584 lines and covers 20 typewritten pages without the translations. The wi'-gi-e tells of the coming of the people of the Tsi'-zhu from the sky to the earth and of the origin of the various symbolic articles used in the ceremonies of the war rites, as well as of the gentile symbols from which personal names are adopted.

2. Wa-zhó-i-ga-tha Wi'-gi-e has 406 lines and covers 15 typewritten pages without the translations. This wi'-gi-e deals with the various heavenly bodies that the people of the Tsi'-zhu of the Seven Fireplaces adopted for their gentile symbols. These heavenly bodies are:

1. Mi, the Sun. 2. Mi'-oⁿ-ba, the Moon. 3. Mi-ká-k'e Hoⁿ-ba doⁿ, the Morning Star. 4. Mi-ká-k'e Hoⁿ-doⁿ, the Evening Star. 5. Wá-ba-ha, travois, Ursa Major. 6. Mi-ká-k'e U-ki-tha-ç'iⁿ, the Double Star. 7. Ta-pá, Deer's Head, Pleiades. 8. Ta Thá-bthiⁿ, the Three Deer. 9. Mi-ká-k'e Zhu-dse (Red Star), the North Star. 10. Shoⁿ-ge A'-ga-k'e e-goⁿ, Dog at the Side, Canis Major.

3. Ki'-noⁿ Wi'-gi-e has 63 lines and covers two typewritten pages without translations. It relates to the symbolic painting of the members of the Tsi'-zhu of the Seven Fire-places when about to go to the ceremony of the Ni'-ki-e degree of the war rites. It refers back to the time when the rites were being formulated. The people asked of one another what they should use for symbolic painting. Then they gathered four stones upon which they put a great pile of dry wood. This they set on fire and the flames that leaped upward

¹ The italic letters in the Indian names indicate peculiarities of pronunciation which it is unnecessary to explain in this brief account.

cast a reddish light upon the darkened sky and upon the people themselves. This reddish light they adopted for their symbolic color and for the color of the symbolic shields which they wear on their breasts when they go to war. They also made it to represent the sun which was their gentile symbol of life.

Besides these wi'-gi-es Xu-thá Wa-toⁿ-iⁿ gave the ritual of the Ni'ki-e degree of his gens, which has four wi'-gi-e and five songs.

In the month of September, 1915, at Mr. LaFlesche's invitation, Xu-thá Wa-toⁿ-iⁿ visited him on the Omaha Reservation, at which time he gave the wi'-gi-e and songs recited and sung by the Tse-dó-ga Iⁿ-dse gens at the Wa-shá-be A-thiⁿ, war ceremonies, together with a detailed description of the ceremonial forms. A description of the Wa-shá-be A-thiⁿ was secured from Wa-xthi'-zhi of the Iⁿ-gthoⁿ-ga gens, but ceremonial etiquette restrained him from giving the parts that belonged to the Tse-dó-ga Iⁿ-dse gens. The wi'-gi-e given by Xu-thá Wa-toⁿ-iⁿ are as follow :

1. Wi'-gi-e of the Sacred Fire, 77 lines.
2. Wi'-gi-e relating to certain symbolic articles made by the gens, 400 lines.
3. Wi'-gi-e of the Sun and the Moon, 17 lines.
4. Wi'-gi-e of the Sacred War-club and the Buffalo Bull, 26 lines.
5. Wi'-gi-e of the Elk, Puma, Bee, Black Ant, etc., 58 lines.
6. Wi'-gi-e relating to the Cleaning of the Sacred Pipe, 47 lines.

Following are the songs given by Xu-thá Wa-toⁿ-iⁿ :

1. Hiⁿ-noⁿ-xpe Ga-xe Wa-thoⁿ, Song 1, four stanzas; Song 2, four stanzas; Song 3, one stanza; Song 4, three stanzas; Song 5, four stanzas; Song 6, six stanzas.
2. Wa-ts'é-the Wa-thoⁿ, Song 1, eight stanzas.
3. Wa-tsé Wa-thoⁿ Toⁿ-ga, Song 1, five stanzas; Song 2, four stanzas.
4. Tsi-ú-thu-gi-pe Wa-thoⁿ, Song 1, twelve stanzas.

The wi'-gi-e and songs that have been recently secured from Xu-thá Wa-toⁿ-iⁿ, with explanatory notes, have not yet been put together and typewritten. On account of other work in process, pertaining to the Osage rites, it will be some time before these can be taken up.

While presenting this report, word has been received that Xu-thá Wa-toⁿ-iⁿ died in December, 1915. (See portrait, fig. 131.) A member of the Tse-dó-ga Iⁿ-dse gens informed Mr. La Flesche that the portion of the tribal rites committed to his gens had died with Xu-thá Wa-toⁿ-iⁿ. This would have been true but for the fortunate circumstance that last September all that the old man knew of

the rites belonging to his gens was secured. This material, together with a paraphrase of one of the *wi'-gi-e* obtained from *Pá-thi"-wa-we-xta* in 1912, makes possible a fair presentation of the rite.



FIG. 131.—Portrait of Xu-thá Wa-to"-i", an Osage.

ETHNOLOGICAL WORK AMONG THE NATCHEZ, CREEK, AND CHICKASAW INDIANS

Dr. John R. Swanton was in the field for about two months during 1915, from toward the end of September until well after the middle of November. The first two weeks and the last week were devoted to work among the few remaining Natchez Indians and the recording

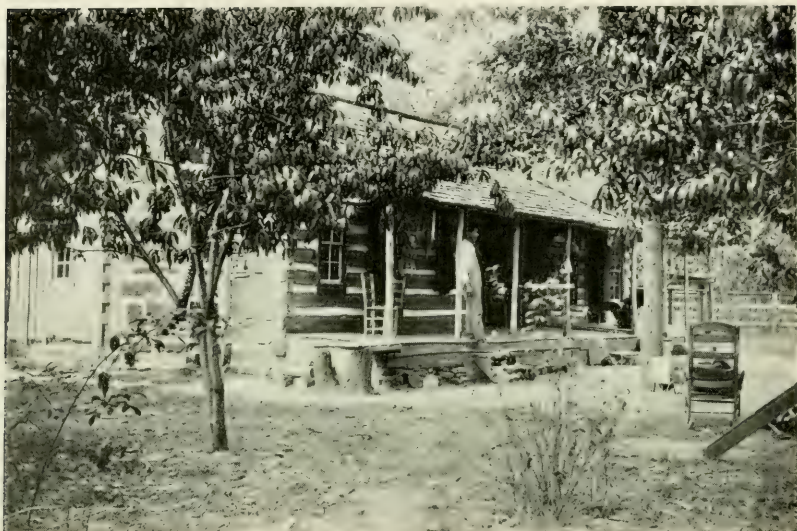


FIG. 132.—Watt Sam, one of the three surviving speakers of the Natchez language, and his home.



FIG. 133.—Hilibi square ground and ball post, near Hanna, Oklahoma.

of texts and other linguistic material from one of the three Indians still able to speak the Natchez language. One hundred and thirteen pages of text with interlinear translations were secured.

About three weeks were spent among the Creek Indians, recording myths and obtaining additional ethnological information. About 80 pages of myths were obtained in English, and in addition 33 pages of native text from a young Creek Indian able to write in his own language.

During the remainder of the time Dr. Swanton made a preliminary visit to the Chickasaw in order to learn how much of their ethnology can be recovered. Not much time was spent in any one place, but a



FIG. 134.—“Stomp ground” in the Cherokee country, Oklahoma. There are seven seats, one for each of the seven Cherokee clans. The Natchez Indians living among the Cherokee have a similar ground.

considerable list of Chickasaw clans was secured and some additional notes were obtained regarding various matters connected with the ancient culture of the tribe.

WORK AMONG THE INDIANS OF CALIFORNIA AND ARIZONA

Mr. John P. Harrington became a member of the staff of the Bureau of American Ethnology February 20, 1915, and devoted the rest of the year to the study of the Chumashan and Yuman Indians of California and Arizona, establishing headquarters for the convenience of his field studies at the Southwest Museum in Los Angeles and at the Panama-California Exposition in San Diego, where he was

granted facilities by the courtesy of these institutions. Results of researches conducted by him before entering the service of the Bureau have been elaborated and necessary additional material has been obtained.

On May 29 Mr. Harrington went to Santa Inés mission where he found among the old records preserved at the mission a manuscript bearing the title, "Padron que contiene todos las Neofitas de esta Mision de la Purisima Concepcion con expresion de su edad, y partida de Bautismo segun se halla hoy dia 1º de Enero de 1814," by Father Mariano Payeras. This document, which appears to have been unknown to historians, is of the greatest value for the study



FIG. 135.—A Yuma fiesta.

of the Indians of La Purisima and Santa Inés. A copy of it was made for the Bureau and a large amount of other material was extracted from the archives of the mission. While at Santa Inés Mr. Harrington succeeded in locating the sites of some of the former rancherias mentioned in the records of the mission.

On June 19, Mr. Harrington proceeded to Arroyo Grande, where he worked for a week with a poor, sick old woman, the sole survivor of the San Luis Obispo Indians. The importance of the immediate rescuing of her language and the other information which she can furnish can hardly be overestimated.

The latter part of July and the month of August were spent in San Diego working with a Chumashan informant. The period from September 1 to December 31 was spent at San Diego and Los Angeles in the elaboration of the San Luis Obispo and other material.

Interesting results of the work are the finding of the existence of totemic clans among the Indians of the Chumashan stock and the determination of the genetic relationship of Chumashan and Yuman.

EXPERIMENTAL FLIGHTS WITH THE ORIGINAL LANGLEY AERODROME

The trial flights with the original Langley aerodrome (built 1898-1903), which were begun in May, 1914, under the direction of Mr. Glenn Curtiss, to determine whether the machine was fundamentally



FIG. 136.—Langley machine in launching condition on skates on Lake Keuka, March 9, 1915.

correct in design and construction, were continued in 1915 at Lake Keuka, New York.

Toward the end of February, 1915, the machine was mounted on three elastic skates preparatory to launching it from the ice on Lake Keuka, with its original motor and as nearly as possible in its original condition. When thus assembled for flight it weighed without pilot 955 pounds, including five gallons of gasoline and the necessary oil and water. The aeroplane frame and wings were on March 2 taken on a tug boat 12 miles down Lake Keuka to where the ice was thick, and placed upon the ice under the brow of a wooded hill whose shelter made it easier to wing and unwing the machine in the wind.



FIG. 137.—Langley machine ascending from the ice on Lake Keuka in March, 1915.



FIG. 138.—Langley machine in flight over Lake Keuka, May 20, 1915.

Short flights were made from the ice. On March 10, after a stationary propeller test on the ice showing a thrust of less than 300 pounds, the aeroplane was headed down the lake against a wind of



FIG. 139.—The Column of Progress at the Panama-Pacific Exposition, 1915.
Photograph by Walcott.

six miles per hour for a trial flight. She ran over the lake at fair speed with but four cylinders working. The poise on the ice was steady. After a short run the rear skate arose clear of the ice; then the front skates of the machine were sustained in the air for some 75 feet, as shown by the measured breaks in the traces on the ice. The

machine then landed gently on the ice owing to the falling off of the motive power.

In May and June several short test flights were made over the waters of Lake Keuka as shown in figure 138.



FIG. 140.—Nearer view of the Column of Progress at the Panama-Pacific Exposition, 1915. Dedicated to aviation; Langley tablet on west side. Photograph by Butman.

The accompanying photographs, figures 139 and 140, show the Langley Tablet on the Column of Progress, dedicated to aviation at the Panama-Pacific Exposition, 1915.

FOG CLEARING INVESTIGATIONS

With the aid of a grant from the Smithsonian Institution, a committee of electrical engineering experts under the general direction of Mr. F. G. Cottrell continued during 1915 the investigations begun by the University of California in cooperation with the United States Lighthouse Service, relative to the clearing of fog by means of electrical precipitation. In a preliminary report read at the first meeting of the committee, Prof. Ryan of Stanford University, says, "Science has established the fact that all dust and fog particles in the open atmosphere are electrified and subject to dispersion or precipitation. It is apparent, therefore, that a source of very high direct voltage with facilities for control and application may be of inestimable value in certain quarters and seasons for clearing fog away from a street, from along a passenger railway, from around the landing stages of a ferry, or possibly about or in advance of a ship under headway at sea."

The clearing of fog differs from the treatment of smoke and fumes in several respects, principally in that the smoke particles must plainly be actually deposited on the electrodes to bring about the desired effect, whereas in treating fog, it is only necessary to cause coalescence of the minute particles into larger ones to give much greater transparency, even disregarding the more rapid settling of the larger drops. However, other difficulties are to be expected in the problem of clearing fog, such as the conditions arising from the continual immersion in the wet atmosphere. What is chiefly needed for an intelligent conception of the problem is actual first-hand experience in handling these and other unusual conditions.

A great deal has been learned during the year about the electrical technique of the problem, and although days of suitable fog conditions have been extremely scarce, on the rare occasions of actual trial, very perceptible clearing for a short distance around the high tension wires was obtained as the fog swept past.

STUDIES IN SOLAR RADIATION

The Mount Wilson Station of the Astrophysical Observatory was occupied by Messrs. Abbot and Aldrich from May to October, 1915, and numerous measurements of solar radiation were made there. During June unusually many days were marred for these observations by cirrus clouds, but the later months were uncommonly fine. In October almost every day proved suitable for the work.

As in former years a principal object of these investigations was to detect and measure changes in the amount of solar heat. Results of the now fully reduced work of 1913 and 1914 show that in 1913 (a time of extremely low solar activity as indicated by the numbers of sun-spots, *faculæ*, etc.), the sun's output of radiation was nearly

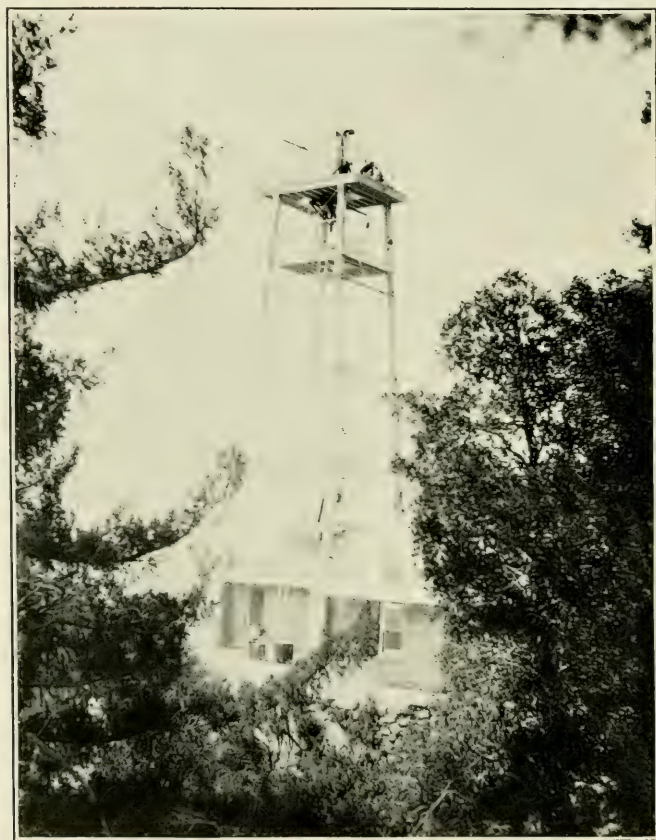


FIG. 141.—Observing station of Astrophysical Observatory on Mount Wilson with new tower telescope. Photograph by Abbot.

three per cent below normal, and that with the return of activity in 1914, the output of radiation rose to about one per cent above normal. The work of 1915, not yet fully reduced, seems to indicate that high values will be found to prevail in this year also.

Fluctuations of solar radiation from day to day, while noted, appear to have been less marked in 1914 than in earlier years.

The need is very urgent that other observing stations in remote regions of the earth take up the daily measurement of solar radiation in cooperation with the Astrophysical Observatory. Preferably not less than four stations in relatively cloudless regions, widely separated, should be engaged in this work. The variation of the sun is established. Its influence on terrestrial climate and conditions of growth of vegetation cannot be well determined unless the results of the Astrophysical Observatory are verified and supplemented by prolonged routine observing at several cooperating stations.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 66, NUMBER 17

EXPLORATIONS AND FIELD-WORK OF THE
SMITHSONIAN INSTITUTION
IN 1916



(PUBLICATION 2438)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION

1917

The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

HA SET POINT (9,000 FT.)

HA SET (SUNSET) MOUNTAIN (9,800 FT.)

VALLEY MOUNTAIN (9,000 FT.)

AN NIBOINE (11,870 FT.)

WEDGWOOD PEAK (9,810 FT.)



View of the mountains from the lake, looking towards the west. The mountains are covered with snow and the lake is calm.

View of the mountains from the lake, looking towards the west. The mountains are covered with snow and the lake is calm.

EXPLORATIONS AND FIELD-WORK OF THE SMITHSONIAN INSTITUTION IN 1916

Every year the Smithsonian Institution initiates or takes part in numerous expeditions to all parts of the world for the purpose of increasing the knowledge in various branches of science. The present pamphlet deals with explorations and field-work in geology, zoology, botany, archeology and ethnology, and astrophysics, during the year 1916, the various accounts being written largely in the words of the investigators themselves.

Friends of the Institution have generously aided this work, particularly during the past few years, through the contribution of funds for specific purposes. Most of the field-work is carried on directly through the branches of the Institution, including the National Museum, the Bureau of American Ethnology, the Astrophysical Observatory, and the National Zoological Park. Wherever funds are not available for specific explorations every opportunity is taken to send representatives of the Institution with such expeditions in order to add to the natural history and archeological collections. The Bureau of Ethnology conducts extensive field-work among the Indians themselves, detailed accounts of which are published in the reports of the Bureau. The Astrophysical Observatory has continued observations in this country and abroad in connection with its work of studying the sun; and the National Zoological Park has cooperated with similar institutions in securing from other countries animals desired for the collections.

These various activities result in valuable additions to scientific knowledge of unexplored and imperfectly known regions, and bring to the collections of the National Museum important material for exhibition and research. Many opportunities for undertaking important field researches and for participating in various expeditions are lost to the Institution every year through lack of sufficient funds.

GEOLOGICAL EXPLORATIONS IN THE CANADIAN ROCKIES

In continuation of work carried on for several years past in the Canadian Rocky Mountains Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, was engaged during the summer

and early fall of 1916 in field investigations on the Continental Divide forming the boundary between Alberta and British Columbia,



FIG. 2.—Cliffs of massive bedded quartzites at north end of ridge of Wedgwood Peak rising 2,000 feet (609.7 m.) above the small lake in foreground. Note the enormous fans at the base of the cliff, as well as the geological structure of the rock wall above. Photograph by Walcott, 1916.

south of the Canadian Pacific Railway. The very heavy snowfall of the previous winter together with frequent snow and rain squalls



FIG. 3.—Looking southeast toward Wonder Pass; Wonder Mountain rising above pass on left; Naiset Mountain and glacier on right. Many of the trees are fine old specimens of Lyall's larch, found at tree line between 6,500 and 7,500 feet (1,981 and 2,285.9 m.) elevation. Photograph by Walcott, 1916.



FIG. 4.—Mount Assiniboine, the Matterhorn of America, reflected in Sunburst Lake, east of Wedgwood Peak. Around the edges of the melting snow banks anemones, lilies, and other spring flowers bloom in profusion, while on the drier slopes summer flowers carpet the ground. Photograph by Walcott, 1916.



FIG. 5.—The wonderfully eroded front of the Assiniboine massif as seen from the northeast. The line of the great over-thrust fault curves through Wonder Pass on left and, crossing beneath the foreground, passes in front of and beneath great cliff of Wedgwood Peak ridge on right. The pyramidal peak of Assiniboine rises 1800 feet (5621 m.) above the lake.

during the summer, had made the conditions unusually favorable for taking photographs, the air being exceptionally pure and clear



FIG. 6.—A magnificent early morning reflection of Mount Assiniboine in Magog Lake. Note the breeze that has just started at the upper end of the lake as shown by the horizontal streak across the water; also the enormous cones of snow at the base of rock cliffs, where ice and snow avalanches have broken from the face of the glacier above to form a second glacier extending down towards the shore line of the lake. Photograph by Walcott, 1916.

during the field season—conditions, however, very unfavorable for geologic investigations.



FIG. 7.—Mount Assiniboine reflected in Sunburst Lake east of Wedgwood Peak. Note the rapidly forming cloud banner which hides the south point of the summit from view. Photograph by Walcott, 1916.

The sections examined and measured extended from the Mount Assiniboine region southwest of Banff, Alberta, northwest to the



FIG. 8.—Mount Assiniboine with its cloud banner lighted by the midday sun and reflected in Sunburst Lake. Photograph by Walcott, 1916.

Kicking Horse Pass, where the Canadian Pacific Railway has bored a double loop through the mountains on the north and south sides of the Pass.



FIG. 9.—Looking down Corral Creek and across the Bow Valley to Mount Temple and several of the “Ten Peaks” from a point near Ptarmigan Pass, 10 to 12 miles (16.1 to 19.3 km.) distant from the Valley of the Ten Peaks. Photograph by Walcott, 1916.



FIG. 10.—Lake Louise (5,670 feet = 1,728.6 m.), the gem of the Canadian Rockies, lying at the foot of the Victoria Glacier and Mount Victoria, which rises 5,685 feet (1,733 m.) above the lake. Mount Fairview, with Mounts Aberdeen and Lefroy, on the left. The view is from a point on the mountain ridge across the Bow Valley about 7 miles (11.2 km.) northeast from the lake. Photograph by Walcott, 1916.



FIG. 11.—Pinnacle Mountain (10,062 feet = 3,067.6 m.) with Sentinel Pass (8,556 feet = 2,608.5 m.) on the left, near the head of Paradise Valley. A passing snow squall has whitened the slopes and old snow banks below the pass. The pinnacles are eroded from the same kind of rock as that forming the massive cliffs of Mount Assiniboine. Photograph by Walcott, 1916.



FIG. 12.—The cliffs of Mount Hungabee at upper end of Paradise Valley, showing expanse of the Horseshoe Glacier. Frequent avalanches of the fresh fallen snow tumbled down the slopes to the fans above the glacier, as the rising sun loosened their hold on the rock ledges. This illustrates very clearly the formation of this type of glacier. Photograph by Walcott, 1916.

A large number of photographs were secured, including a number of panoramic views made on continuous films eight feet in length, a portion of one of which is reproduced in figure 1, the frontispiece.



FIG. 13.—Paradise River in its fall down the massive quartzite steps of the Giants' Stairway. The rocky walls of Mount Lefroy rise in the background. Photograph by Walcott, 1916.

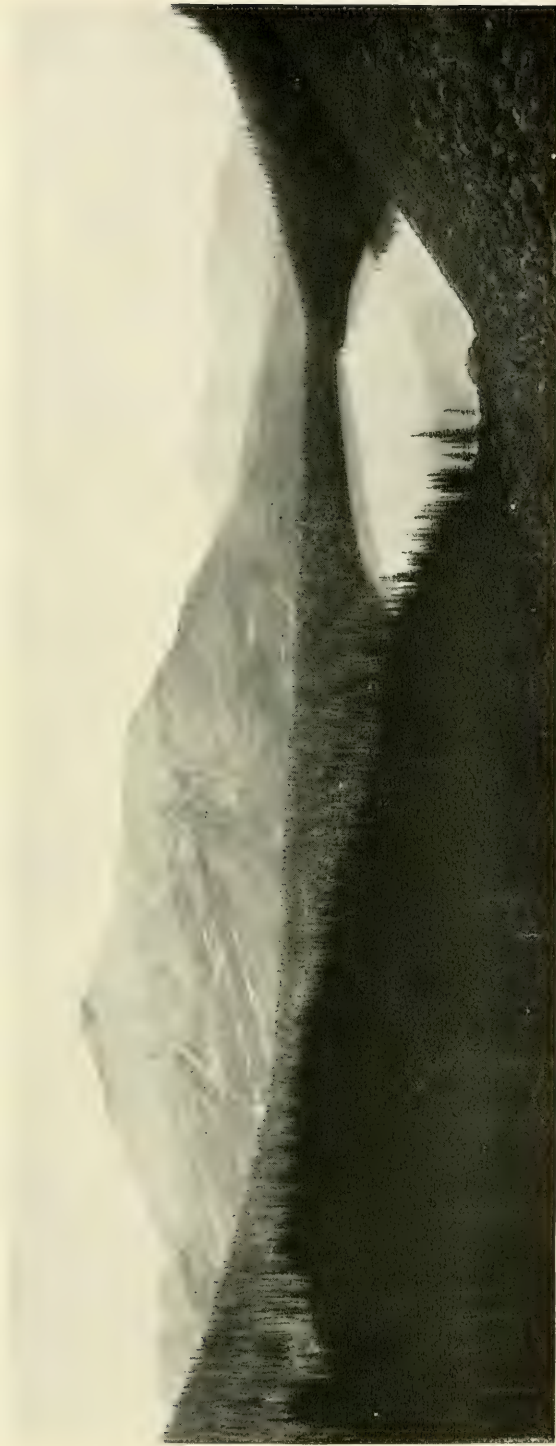


FIG. 14.—Looking north from the slope of Popes Peak over the beautiful emerald green water of Ross Lake and the dark forest to the steep face of Mount Bosworth on the Continental Divide and above Kicking Horse Pass, Mount Hector in the distance. Photograph by Walcott, 1916.

The season's work was undertaken with two principal objects in view: first, to determine if possible the base line of demarcation between the Lower and Middle Cambrian; and second, to locate the

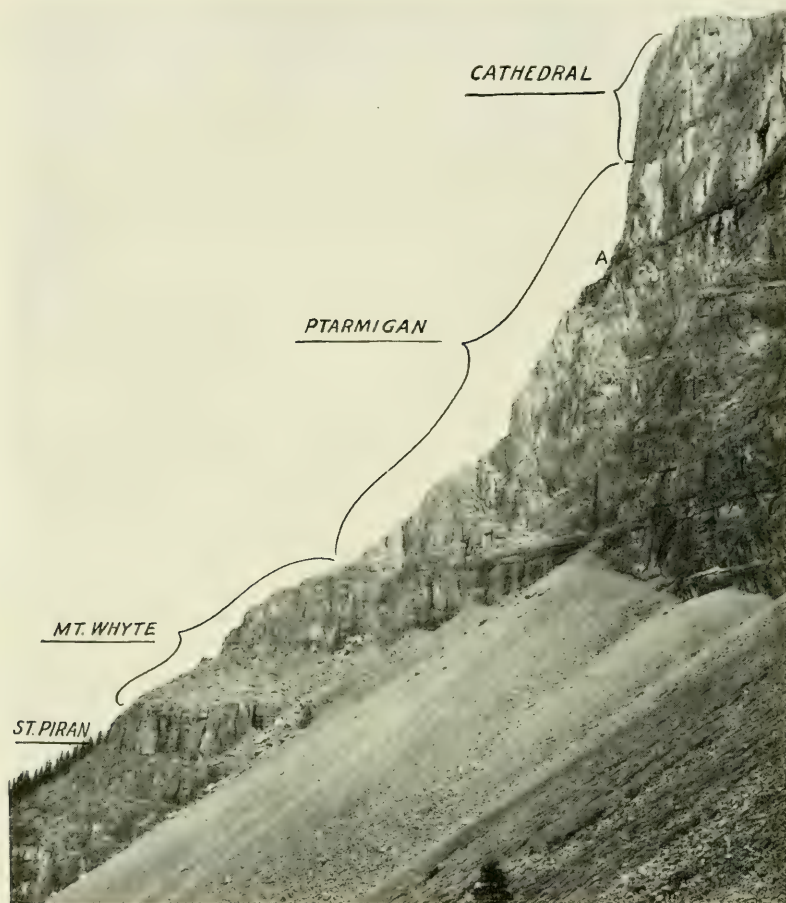


FIG 15.—North profile of ridge above and southeast of Ross Lake, 1 mile (1.6 km.) south of Stephen Station on the Canadian Pacific Railway.

The position of the *Albertella* zone is shown at *A* where the thin band of shale forming the Ross Lake shale member of the Ptarmigan formation may be seen from the Kicking Horse Pass as a dark narrow band.

The relative positions of the Cathedral, Ptarmigan, Mount Whyte, and St. Piran formations are indicated on the plate. Photograph by Walcott, 1916.

exact horizon of a Cambrian subfauna (*Albertella*) that had in its entirety been found only in drift boulders in the Kicking Horse Valley east of Wapta Lake.



FIG. 16.—Panoramic view of Phareo Peak, Scarab Lake, and in the distance Mount Ball. This view well illustrates the cliffs fronting the overthrust fault northwest of Mt. Assiniboine and east of Simpson Pass. Photograph by Walcott, 1916.



FIG. 17.—Alex and Arthur packing up Old Baldy for an early morning start. Photograph by Walcott, 1916.



FIG. 18.—A camp site at last. Where we came down 2,000 feet (609.7 m.) on a blind trail through a wind-fall on "Burnt Timber Hill" in a cold rain. This was one of the reasons why it required three days to reach Assiniboine from Banff. Photograph by Walcott, 1916.



FIG. 19.—Crickett inquiring why the pack train does not start, as she is tired of standing with the heavy pack. Photograph by Walcott, 1916

One of the important incidental results obtained was the discovery at Wonder Pass (fig. 3) of the great overthrust fault by which the basal Cambrian rocks forming the mountains on the west (right) side of the Pass have been thrust eastward over upon the limestones of the Devonian, shown in the slope on the east (left) side of the Pass. The thrust along this fault has carried the rocks forming the main range of the Rockies in this area several miles to the eastward.



FIG. 20.—On the trail to Wonder Pass with a northwest gale to face. The horses always turn their backs to the wind when resting. Photograph by Walcott, 1916.

The fault crosses through Wonder Pass and then curves to the northwest, southeast of Magog Lake, shown in figure 5, to the great cliff forming the northern extension of the Assiniboine massif (fig. 2). During the million or more years that the agencies of erosion had been wearing away the great mass of rocks above the fault, mountain peaks, canyons, and ridges have been carved and polished by frost, snow, and the grinding force of huge glaciers. The glaciers have now retreated to a point near their origin, high up on the mountains,

but they have left behind them basins that are filled by beautiful lakes, such as Magog (fig. 5), Sunburst (fig. 4), and Ross (fig. 14).

The line of demarcation between the Lower and Middle Cambrian was found to be high up in the section on the face of the cliffs at Wonder Pass, and throughout the Assiniboine massif.

While camped on Magog Lake below Mount Assiniboine, some marvelous reflections of the peak in the waters of the lake were seen



FIG. 21.—A noonday rest at Wonder Peak, after climbing up the side of Naiset Mountain. A shelter was made of saddle blankets to break the force of the cold wind. Photograph by Walcott, 1916.

in the quiet of the early morning, and by a fortunate combination of a "clear-cut" day and calm at the lake level, the photographs reproduced in figures 6, 7, and 8 were secured. The changes in the "cloud banners," at the peak, which occur very rapidly, are well shown by figures 7 and 8. These views led us to regard the grand pyramid of Mount Assiniboine as the Matterhorn of America.

Northwest of Banff the broad valley of the Bow has been eroded diagonally back through the massive scarf of the overthrust massif

and thus exposed to erosion the heart of the great arch that had its crest over the region now occupied by Mount Victoria and other peaks of the Bow Range.



FIG. 22.—Standardizing the size of an old trail gang oven beside the trail.
Photograph by Walcott, 1916.

A glance into this wonderland is shown by figures 9 and 10, which are views looking south across the Bow Valley into the heart of the Rockies. The illustration of Pinnacle Peak (fig. 11) tells the story of the tremendous power of erosive agencies, where the colossal

quartzites and limestones are shattered and eroded into the most fantastic forms.

West of Pinnacle Peak, at the head of Paradise Valley, Mount

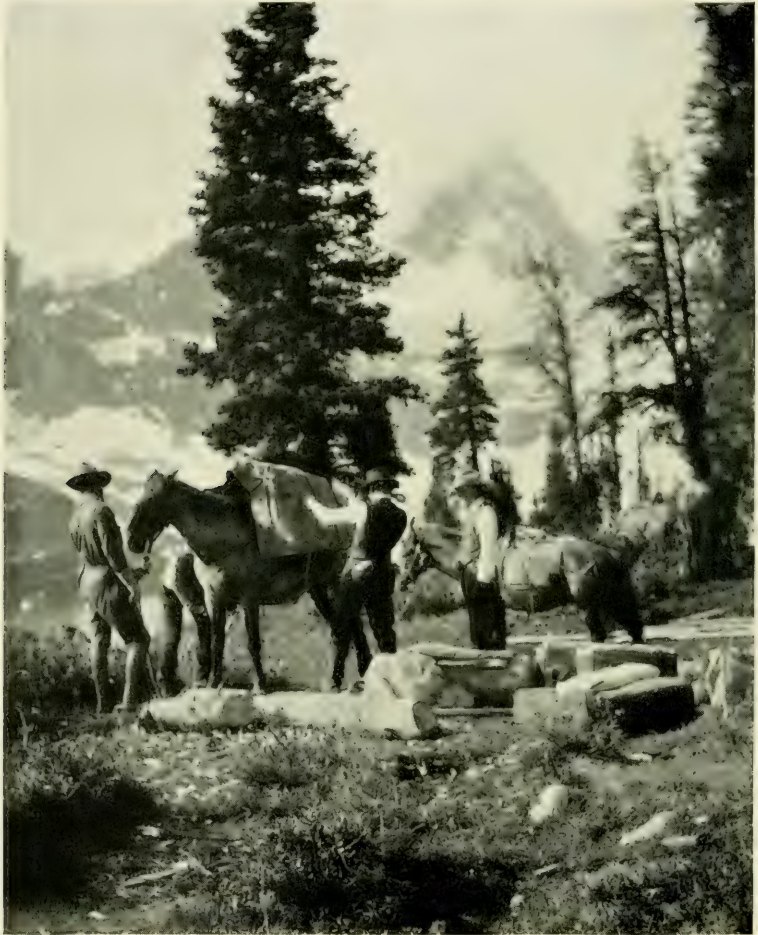


FIG. 23.—Breaking camp and packing up at Mount Assiniboine camp.
Photograph by Walcott, 1916.

Hungabee rises in a terraced wall 4,000 feet above the glacier at its foot (fig. 12), while another glimpse of these great cliffs is seen under Mount Lefroy, where the melting snows cascade down as a beautiful brook over the quartzite ledges (fig. 13).

At last, in the cliffs above Ross Lake (fig. 15), the *Albertella* fauna was located in situ, and from the slopes above the lake a panoramic view (fig. 14) was taken of Mount Bosworth, above Kicking Horse Pass on the Continental Divide. Although only 9,083 feet in height, Mount Bosworth exposes in its slopes over 12,000 feet in thickness of bedded rocks that constitute one of the best sections of the Cambrian rocks found in the Canadian Rockies.



FIG. 24.—Waiting for the odds and ends for the last pack at Red Earth Creek camp. The last outfield camp of 1916. Photograph by Walcott, 1916.

Considerable collections of Cambrian fossils were obtained by Secretary and Mrs. Walcott, who accompanied and worked with him throughout the trip, before the storms of late September drove them back to Banff and ended the research for the season.

A few of the incidents of life along the trail are illustrated by figures 17 to 24.

GEOLOGICAL FIELD STUDIES

Dr. George P. Merrill, head curator of geology in the National Museum, devoted several days of the summer vacation period to

visiting the gem and feldspar quarries of Auburn, Topsham, and neighboring areas in Maine. While nothing new was secured, he was able to add interesting material to the exhibit illustrating the character and association of the pegmatite dikes, which is now being installed in the Museum.

In May Dr. Edgar T. Wherry was detailed by the Museum to carry on field studies of certain minerals, rocks, and soils in eastern Pennsylvania. Collections of diffusion rings in shale, of glauberite crystal cavities in shale, of the rare iron silicate chloropal, and of certain soils and the associated rocks, were made. These specimens have been added to the Museum collections, and are being investigated. Articles on the glauberite cavities and on one group of soils have been published.

In June certain gem and mica localities in New Jersey and southeastern Pennsylvania were visited by Dr. Wherry, and Dr. W. T. Schaller of the U. S. Geological Survey. In the course of this trip a number of specimens of minerals were obtained for the Museum collections.

HUNTING GRAPTOLITES IN THE APPALACHIAN VALLEY

The great value of the extinct organisms known as graptolites in determining the age of geological formations which contain few and often no other kinds of fossils, has been proved time and again. During the summer of 1916 Dr. R. S. Bassler and Mr. C. E. Resser, both of the division of paleontology, U. S. National Museum, had occasion to test this particular group of fossils in the course of a study of the Cambrian and Ordovician shale formations of western Maryland. Recent excavations along the Western Maryland Railroad, in the great shale belt just west of Williamsport and extending north and south for hundreds of miles, exposed these rocks to such advantage that it was thought possible enough fossils could be found in them to determine their exact geologic age and structure. However, no fossils of any kind were found after much search. It was then decided that the rocks were either barren of organic life or the cleavage produced in the strata by the great forces resulting in their present folded condition destroyed all traces of fossils.

Finally the fold of black shale shown in figure 25 was observed, and at the point marked X, where the cleavage and the bedding planes coincided, abundant graptolite remains were discovered. The species which were collected proved to be of such typical Trenton forms that there could be no doubt of the Middle Ordovician age of

this particular shale. Limestones known to be much older outcrop so short a distance to the east of this that a great fault or displacement between the two kinds of rocks is clearly indicated.

With these facts in hand, the fault was traced for a distance of thirty miles north and south, thus again showing that the graptolites proved the key to the geologic structure of the region.



FIG. 25.—Fold in Ordovician shale west of Williamsport, Md. Graptolite fauna found at X, where cleavage and bedding planes coincide. Photograph by Bassler.

EXPLORATIONS IN THE OHIO VALLEY FOR FOSSIL ALGAE AND CORAL REEFS

Through the extensive studies of the Secretary for several years past, the collections of the National Museum are rich in limestone-forming pre-Cambrian algæ—a low order of water plants that secrete lime or silica. An instructive series of these fossils has been placed on exhibition, but in order to show the geologic occurrence and evolution of this group of plants it was necessary to supplement the pre-Cambrian forms with specimens of more recent age. Accordingly

Dr. R. S. Bassler, curator of paleontology, spent some weeks in the Ohio valley, particularly in the Blue Grass region of Kentucky, in a search for large exhibition specimens, and in a study of their mode of occurrence. He was successful in procuring a number of showy exhibition specimens as well as numerous study collections.

More difficult, however, was the discovery and quarrying of a fossil coral reef suitable for exhibition in the Museum. Coral reefs are known at several horizons in the Paleozoic rocks of the Ohio



FIG. 26.—Strata outcropping along Chenoweth Creek at Jeffersontown, Ky., and containing a coral reef. See text for lettering. Photograph by Bassler.

valley but they are seldom so exposed that an instructive section can be quarried out without injury to the specimens. A great reef of corals outcrops in the strata along the banks of Chenoweth Creek at Jeffersontown, near Louisville, Kentucky, and this was selected to furnish an exhibit for the Museum. A section of the stratified rocks, 6 feet by 10 feet, outlined in the accompanying photograph (fig. 26),

was bodily quarried out of the bank, and these strata with their contained corals were later set up in the exhibition hall of paleontology.

The lowest layer of limestone (A) is composed largely of fossil brachiopod shells. Next above is a layer with scattered corals (B) belonging to a long-tubed species (*Columnaria calicina* Nicholson), probably torn by waves from a nearby coral reef. Overlying this is a limestone stratum (C) largely made of the twiglike stems of stony Bryozoa (Trepostomata).



FIG. 27.—Trenton limestone outcrop near Lexington, Ky., with one stratum containing large heads of coral (X). Photograph by Bassler.

The main reef of corals (D) is chiefly composed of the rounded heads of three species of honey-comb corals, some with radial partitions in the tubes (*Columnaria alveolata* Goldfuss), others without such partitions (*Columnaria vacua* Foerste), and still others with spongy walls (*Calapoecia cribriformis* Nicholson). Large stems of fluted or nodular Hydrozoa (*Beatricea*) are scattered among the honey-comb coral masses.

Horn corals (*Streptelasma rusticum* Billings) are to be seen in both the lower and upper coral beds. The spaces between the lime-

stone layers and also between the heads of coral were filled with clay which contained many other examples of fossil life.

Another coral reef in central Kentucky composed of a single species (*Stromatocerium pustulosum* Safford) was investigated and several massive and complete specimens excavated for exhibition. The smallest of these was several feet in diameter. As shown in the accompanying photograph (fig. 27) these conical coral masses (X) are restricted to a single layer of limestone, on which account they serve excellently in recognizing the bed from place to place. This coral reef occurs in the Trenton limestone and outcrops to advantage around Lexington, Kentucky, although it has been noted at many localities in central Kentucky and central Tennessee.

No expeditions were in the field during the season from the section of vertebrate paleontology. Much valuable material was, however, collected and sent to the Museum by the field parties of the U. S. Geological Survey.

EXAMINATION INTO THE SUBJECT OF SUPPOSEDLY ANCIENT HUMAN REMAINS AT VERO, FLORIDA

On the invitation of Dr. E. H. Sellards, state geologist of Florida, and as his guest, Dr. Hrdlička spent four days in the latter part of October, 1916, at Vero, Florida, where his time was devoted to the study of the site from which certain human bones described by Dr. Sellards were obtained, and to a preliminary examination of the bones themselves.

Laborers were engaged and with their help there was made a clean exposure about 160 feet in length of the geological deposits in close proximity to the localities where the human bones had been discovered. This afforded a comprehensive and enlightening view of the formations involved.

The two human skeletons had been found in the south bank of a recently excavated drainage canal. They occurred, one in fairly close proximity to, and the other within the broad shallow bed of, a small fresh-water stream, now drained by a lateral cut from the canal. The former lay in dark and somewhat indurated sands, the latter for the most part at the base of the muck deposit of the stream bed, and between this and the next older stratum. A few smaller bones which probably belonged to the second skeleton were found at about the same level a short distance from the rest of the remains in an elevation of the lower sandy layer.

The first skeleton lay at a depth of two and a half feet, the second at a depth of two to three and a half feet from the sur-

face. The deposits above the first skeleton consisted partly of somewhat indurated and partly of ordinary sands, overlaid by a layer of marl. The marl when freshly exposed was found to be of the consistency of fresh mortar, but on longer exposure hardened to fairly solid rock. Above skeleton II, there was only muck and irregular sandy patches.

Skeleton No. I is that of a woman probably adult, skeleton No. II that of an adult man of somewhat advanced years. The bones of the former lay close together, those of the latter were dissociated though lying within a moderate-sized ellipse. Broken pottery, bone and stone implements, and stone chips, were found in the same strata, more particularly in the muck layers, with the human bones.



FIG. 28.—The locality of the Vero finds.

Besides the two skeletons, single bones of three additional human bodies—one a child, one a young person and one an adult—were discovered in the vicinity. The human bones were considerably mineralized and in the same strata in which they occurred are found many bones of long extinct animals such as mastodons, tapirs, etc.

Due to the presence of the fossil animal bones in the same strata with the human remains, and to the mineralization of the latter, the opinion was advanced that the human remains were of the same age as the animal bones, which would relegate them to the early part of the Quaternary.

This was not sustained by an anthropological study of the case and of the remains. The human bones show no signs of weathering, gnawing, or trampling, and the two skeletons were represented by so many parts, that the only satisfactory explanation of the conditions can be found in the assumption that the remains are those of intentional burials.



FIG. 29.—The Vero skull (Skeleton No. II), top view. Reconstructed at the U. S. National Museum.

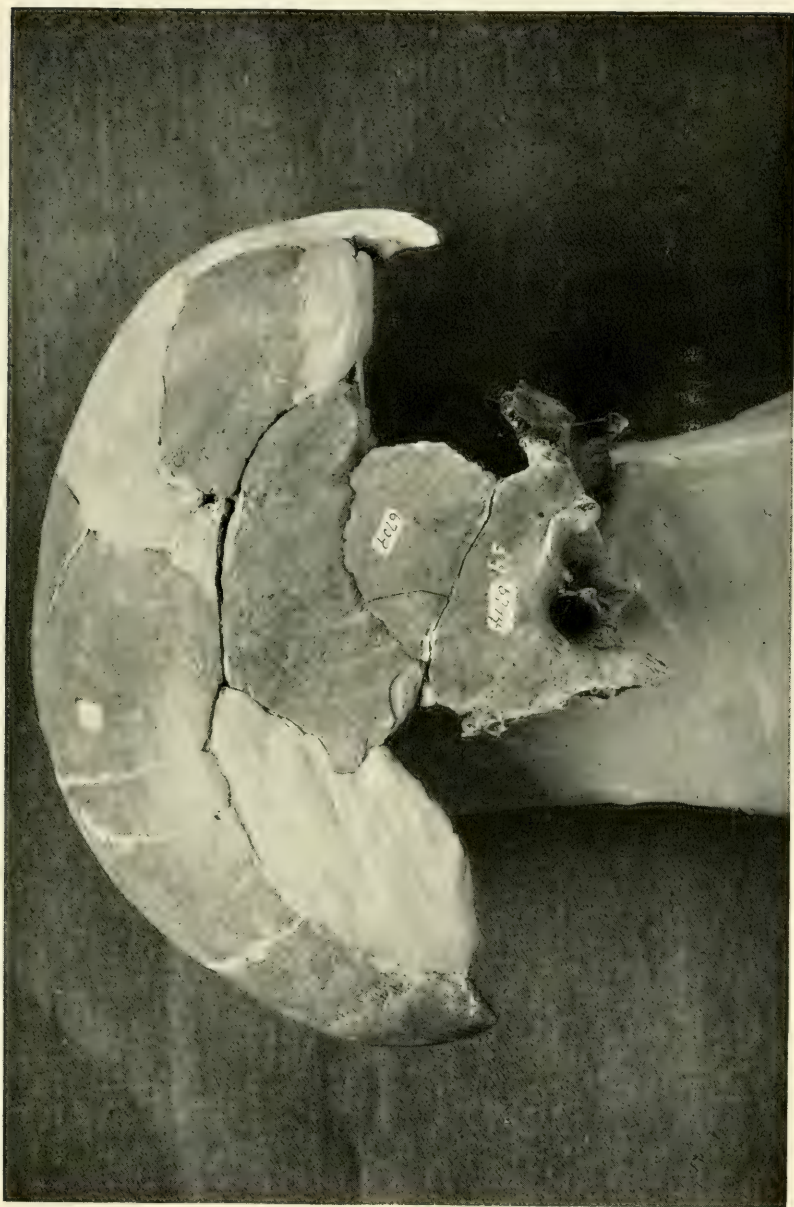


FIG. 30.—The Vero skull (Skeleton No. II), right side.

The pottery and the bone and stone implements are all identical with similar artifacts of the Florida or south-eastern Indians; while the human bones themselves show without exception modern features, with numerous characteristics which permit their identification also as Indian.

The conclusions arrived at are, that the Vero finds represent another of those cases, which are bound to occur from time to time, where the circumstances seem to point to antiquity of the human bones, but where a thorough all-sided inquiry shows that the mass of the evidence is decisively against such an assumption.¹

ALEŠ HRDLÍČKA.

TRIP TO FORT MYERS REGION, WEST COAST OF FLORIDA

Following the visit to Vero a trip was made to Fort Myers, Fla., and to several of the outlying keys, where human remains were reported. The particular object of this trip, was to visit a small island off Fort Myers known as the Demorest or Demere Key, on which, according to information obtained from Mr. Sam L. King of Bristol, Tennessee, human bones could be found "imbedded in concretionary materials."

After arrival at Fort Myers a number of gentlemen were met who gave material assistance in locating and reaching the small key, and in making such exploration and collections on the same as were possible within the limited time at our disposal. Those who should be especially mentioned in this connection are Capt. George F. Kinzie, Mr. A. H. Gillingham, and Mr. Richard Eybor.

Demere Key, the surface of which measures about fifteen acres, was originally a low and swampy island, like all the small keys in the vicinity, but a larger part of its surface was in the course of time artificially elevated by the Indians, by means of shells, sand, and soil, for the purposes of habitation and cultivation. Along the middle of this large artificial elevation runs a remarkable platform about 80 feet long, the eastern boundary of which is supported by a still fairly well preserved, well-made wall of conch shells. This structure has been briefly reported by Cushing,² and by Mr. Clarence B. Moore,³ but its origin is in doubt. At a short distance north-east of this elevation there is a low, irregular heap which contains numerous Indian burials. On examining the surface of this heap it was found to

¹ A preliminary symposium on these finds appeared in *The Journal of Geology*, No. 1, 1917; Dr. Hrdlička's full report will be published by the Bureau of American Ethnology.

² *Proc. Amer. Philosoph. Soc.*, Vol. 35, 1896, p. 237.

³ *Antiquities of Florida, West Coast*, p. 366.

consist of shells, detritus, sand and vegetable matter, and to be everywhere more or less consolidated to the depth of from six to eighteen inches. The consolidation was such that in many places it was very hard to penetrate the crust with an ordinary mattock. Within this crust, on breaking parts of it off and turning them over, were found numerous human bones, including some more or less defective skulls. Beneath the crust was white sand, which also contained many bones, with a few Indian ornaments and fragments of pottery. The consolidated crust differed in composition. For the larger part it was coquina, of just about such a composition as beach accumulations along the sea; but in other places the solidified part consisted almost entirely of white sand, while in still others it was a dark concretionary mass enclosing shells, sand and vegetable matter, besides the bones. The human bones, though evidently more or less changed, were not yet petrified; and the mound as a whole appears to have no claim to antiquity greater than perhaps a few hundred years; but its surface offers a fine example of what favorable conditions can accomplish in no great space of time in the way of consolidation and inclusion in rock of human remains.

A series of interesting specimens from the mound are now on exhibition in the U. S. National Museum.

ALEŠ HRDLÍČKA.

EXPEDITION TO BORNEO AND CELEBES

In the report on explorations during 1915 (Smithsonian Misc. Coll., Vol. 66, No. 3, pp. 41-44), I said that Dr. Abbott had decided to continue the work begun in Celebes by Mr. H. C. Raven, and that Mr. Raven had spent part of the summer of 1915 in Washington assembling his outfit. The return journey began late in October. On January 4, 1916 Mr. Raven arrived at Menado, Celebes. His work from January to the end of August was in the northeastern part of the island. Some idea of the conditions under which it has been carried on is given by the photographs here reproduced, and by the following passages from letters:

MENADO, CELEBES, January 4, 1916.

I arrived here this morning and am very glad to have finished my journey. As yet I have not definitely planned my route, but it will probably be best to start on the extreme end of the peninsula, somewhere in the mountains near Likoepong and work along toward Gorontalo.

LIKOEPAANG, CELEBES, March 9, 1916.

I have been collecting here and at a place a few miles southeast of here since January 12th. I am now living in the kampong, but my other camp was in heavy forest more than two miles from any home or clearing. The natives call the former place "Teteamoet" and the forest there is the finest I have seen in

Celebes. Rats were fairly common and I have gotten about seven species. *Sciurus leucomus* is also common as is *Sciurus murinus*, but I have seen no other squirrels. Big game is scarce and I have shot nothing larger than the black monkeys, of which I have a good series (15) and feel quite sure that you will find them to be a different variety than those I formerly collected. The crest seems much longer, the callosities are a different shape and the face narrower. [They are *Cynopithecus* (fig. 34), while those previously obtained were *Magus* (fig. 33).]



FIG. 31.—A mother and her two daughters, natives of Temboan, Celebes. Nearly all of the natives of Minahassa are Christians.

This is not just the bat season, the natives claim, as it has been raining almost steadily and there is no fruit about. I have got five species of bats, among them five specimens of a large-eared *Megaderma* which is new to my collection. In all I have something over five hundred specimens, most of which are mammals; also I have got quite a number of land shells.

I am now about to start for Goenoeng Klabat, as with much trouble I have managed to get fairly dry the specimens on hand.

AYERMADIDI, MINAHASSA, CELEBES, May 9, 1916.

I am sorry to have to say that since Likoepong I have been able to do only a few days' work. Shortly after leaving Likoepong I had a little fever, but thought it was about over. So I hired a native house here and tried to do a little collecting and to get rid of my fever. After a week or so the fever disappeared and I went up on Goenoeng Kalabal and made camp at an altitude of about 5,600 feet. We were in the clouds almost continuously and there was also a great deal of rain. Animal life of all kinds was scarce, though what



FIG. 32.—An old man of Temboan. There are very few natives in Minahassa at the present time who dress in this manner.

little I did get may prove interesting. I saw tracks of two or three Anoa [dwarf buffalo] on the very summit and in the crater; also tracks of a pig, but nothing else large. I changed my traps every night so that I trapped all the way from about 5,000 feet to the summit, but got only a few rats. There are five species, I think, and one or two of them seem to vary somewhat from the ones from Likoepong of the same species. I got ten or eleven species of birds, eight of which are new to my collection, and I think not found in the low lands.

At the end of eight days I felt bad and came down to Ayermadidi. That was on April 12th, and from then on I had more or less fever and finally mumps and high fever. This gradually increased so that I was unable to eat or drink anything for 9 days. As quinine had no effect on the fever I finally had to go to Menado to the military doctor there. He stopped my fever in two days, but then I was nearly "all in," my temperature way below normal and pulse little more than fifty. I came around all right anyhow, so that I



FIG. 33.—"Betchie," my black monkey from Toli Toli, a most affectionate and gentle animal. She remembered me after an absence of ten months.

could walk after four or five days and now am all right but a little weak. The hotel at Menado (or in fact anywhere, where one can get European food) is expensive; here is better (cheaper) than Menado and cooler. The doctor said I should go to Tondano for a couple of months where the climate is very cool, but if I improve as of late I think that in less than a week I can start for Lembeh and do some collecting. Lembeh has no resident population, whereas Tondano has more than 12,000.



FIG. 34.—The black monkey of Likoepong, showing the well-developed crest in comparison with the one from Toli Toli.



FIG. 35.—Many of the natives here use the ground as a floor, with the dooryard always swept surprisingly clean. Temboan, Kalait R., Celebes.

MENADO, CELEBES, August 20, 1916.

I returned to Menado about a week ago from south of Amoerang in the mountains where I had made a camp and stayed for about a month. There I got a great many rats, including one or possibly two species that I had not before seen in Minahassa. Something that you may find interesting is quite a good series of shrews of two species, one grey and one black. I am looking forward to getting more of these now that I know how to catch them. The ones I have were caught by native boys. I have often tried with "Out-o'-sight" traps to catch these, but without success. To catch them the



FIG. 36.—Mount Sapoetan, an active volcano in central Minahassa, Celebes.

natives dig a hole about 4 feet deep and three or four feet in diameter and put corn in the hole as bait.

I have decided that a slight change in our plans will probably save time, so instead of going from here to Makassar I am going from here to Parigi and work southward from there to the Lake of Posso; thence to Palopo. Dr. Abbott has written me about the importance of this central part of Celebes ethnologically, and from what I have heard from officials here it must be very interesting country.

I think if I use Paloe or Parigi as a base and first make a trip north from there I shall have fairly well covered all this northern peninsula. Then I can work southward.

In Minahassa I have been disappointed at not being able to get more bats and more large mammals. A short time ago I got a large squirrel about the size of a *Ratufa* which I believe is very rare here.

During this expedition Mr. Raven has traveled by land instead of by water. His covered cart is shown in the photograph (fig. 37). At Parigi he intended to secure about six pack horses.

Only one shipment of specimens had been received up to January 8, 1917. It includes three hundred and nineteen mammals and about three hundred birds; also numerous reptiles, mollusks, and insects.

GERRIT S. MILLER, JR.



FIG. 37.—My cart and horses on the road to Tondano. In this way I traveled wherever there were good roads in Minahassa.

EXPLORATION IN CHINA

Owing to a variety of circumstances, the work of Mr. Arthur de C. Sowerby, in China, has been less successful than usual. At the end of 1915 he visited Shanghai and parts of the neighboring country on the lower Yangtze. Field-work during this expedition did not produce any very important results; but the examination of the Heude collection of mammals in the Sikawei Museum has thrown much light on one of the most difficult problems connected with the systematic study of Chinese mammals. Heude assembled a large collection of skulls, chiefly of bears and ungulates, from all

parts of China, and from other regions in the east. He made this material the basis of many technical papers. In all of these he applied a standard of specific differentiation so unlike those in use by other zoologists that his work could not be understood. Mr. Sowerby has been able to make good preliminary reviews of Heude's bears, pigs, and goat-antelopes. Papers on these three important groups may be expected to appear in the near future.

In March Mr. Sowerby returned to the Yangtze. This expedition was an almost complete failure. Mr. Sowerby writes (June 10, 1916):

My recent trip to Che Kiang was brought to a summary close by the outbreak of hostilities in that region. I could not get any transport and very nearly had my retreat cut off. Nothing can be done now till the provinces have come to an agreement as to who shall be president and just how the government is to be run. There is only north Chili left to work in and I hope to go there this autumn. China is in such an unsettled state that if it were not for the war in Europe it would be attracting everybody's attention. Conditions are no better than they were during the revolution of 1911.

No specimens collected during 1916 have yet been received from Mr. Sowerby. Material from the Yangtze and from several localities in northern China is expected soon to arrive.

GERRIT S. MILLER, JR.

EXPLORATIONS IN SANTO DOMINGO

Dr. W. L. Abbott, whose energies for nearly thirty years past have been devoted to explorations in the Old World, made a short visit to Santo Domingo (the scene of his earliest expedition, in 1883), where he spent a few weeks in late summer and fall, 1916, at the eastern end of the island, chiefly in the vicinity of the Bay of Samaná, with trips to several localities in the highlands of the interior, notably at Constanza and El Rio. On this expedition he made a very interesting collection of mammals, birds, reptiles, mollusks, insects, and Indian relics.

In the coast region, Dr. Abbott investigated numerous caves in search of remains of an extinct mammalian fauna. The results of this part of his work have been described by Mr. Miller (Smithsonian Misc. Coll., Vol. 66, No. 12, December 7, 1916). One of the most interesting mammals whose remains were found in these caves is a large rodent, described from a freshly killed specimen in 1836, but not captured since then. Whether it is extinct or not is at present an uncertainty. The skull found by Dr. Abbott is shown in figure 38. At San Lorenzo Bay, on the south side of the Bay

of Samaná, there are "many precipitous limestone hills," which, Dr. Abbott writes, are "literally honey-combed with caves. The cave (usually inhabited) near the pier of the abandoned railroad is full of shell-heaps, and contains many Indian carvings, more or less obliterated by smoke and lime deposits." Here he uncovered two hundred or more archeological objects, including terra cotta images, fragments of pottery, stone pestles, carved stone plates and similar material.

After exhausting the caves in the vicinity of Samaná, Dr. Abbott visited the mountains of the interior, where, at El Río,¹ he made a most surprising discovery in the bird fauna. He writes "I had heard of a very small 'parrot' which lived in flocks in the pines

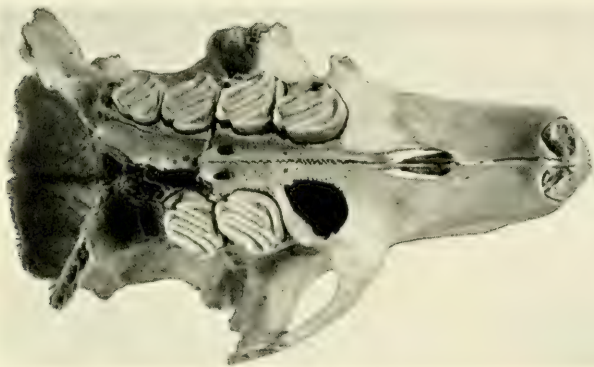


FIG. 38.—Skull of *Plagiodontia*, a rodent once common in Haiti and Santo Domingo, but now perhaps extinct. It was eaten by the Indians and by the European settlers of the island. (Enlarged.)

on the pine cones. I suspected a crossbill—said to occur here at Jarabacoa, below 2,000 feet, but the pair I shot were at near 5,000 feet." The bird proved to be a veritable crossbill and, what was most extraordinary, a form closely related to the White-winged Crossbill (*Loxia leucoptera*), a species restricted in the breeding season to the Boreal zone of North America (from Alaska to the higher Adirondacks), migrating in winter at rare intervals as far south as North Carolina. Red Crossbills, of the *Loxia curvirostra*

¹ El Río is "a new settlement formed 16 years ago in the upper valley of the Emenoa, which flows into the Yaquí River (del Norte). Elevation about 4,000 feet. About 20 miles by road from Jarabacoa. There are about 600 to 800 people settled within a few miles of El Río. No town, only a shop (tienda) and a cock-pit. Beautiful and fairly fertile district," according to Dr. Abbott's descriptive notes.

group, are now known to inhabit the highlands of Mexico and Guatemala and of the Philippines (Luzon), but the presence of a form of White-winged Crossbill within the tropics was wholly unexpected. The new bird, recently described as *Loxia megaplaga*, closely resembles its Boreal relative in color, but possesses a much heavier bill, the mandibles approximating in bulk those of the Red Crossbills, whereas those of the White-winged species are of much feebler build (see fig. 39).

Another problem in distribution is furnished by a new species of *Brachyspiza*, obtained at Constanza, at an elevation of about 4,000 feet. *Brachyspiza* is a genus of non-migratory sparrows, ranging

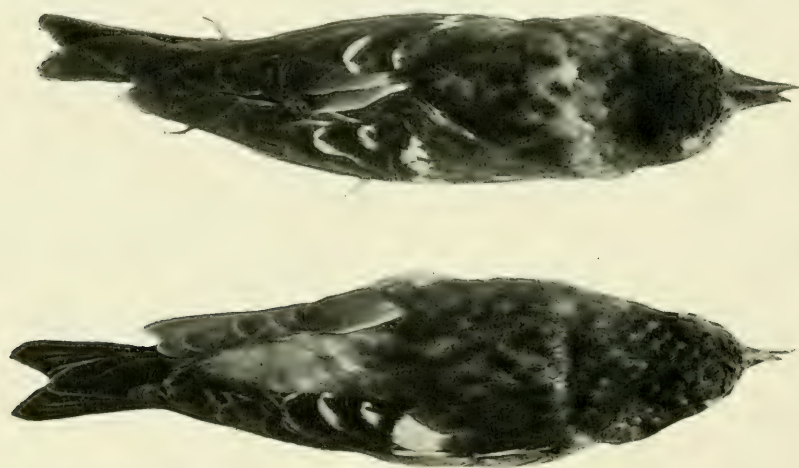


FIG. 39.—Upper figure, Santo Domingo Crossbill (*Loxia megaplaga*), showing heavy bill. Lower figure, White-winged Crossbill (*Loxia leucoptera*), showing slender bill.

from the mountains of Mexico to Chili, with related species in British Guiana and Curaçao, but hitherto not recorded from any part of the West Indies proper. The discovery of a species of this genus in the mountains of Santo Domingo is noteworthy, particularly as the new bird (*Brachyspiza antillarum*) is more nearly related to the mainland bird (*B. capensis peruvienensis*) than to the form from Curaçao (*B. capensis insularis*). A large owl (*Asio noctipetens*) found at Constanza proved to be new, though not distantly related to a species of Cuba and Mexico. The Santo Domingo Barn Owl (*Tyto glaucops*), described many years ago, but still very rare in museums, is represented by three fine specimens, the first received by the National Museum. Five examples of the equally rare Narrow-

billed Tody (*Todus angustirostris*) were obtained near Constanza, where it replaces the ordinary Tody (*T. subulatus*) of the lower country. A very rare siskin (*Loximitris dominicensis*), peculiar to the island and hitherto represented in the Museum only by the type of the species, was found at El Rio.

One of the commonest and most conspicuous birds, and one restricted to the island, is the Palm Chat (*Dulus dominicus*), sole member of the family Dulidae, whose systematic position is in doubt. It is a species of peculiar habits and traits; its manner of nesting, for example, is quite unlike that of any other known American bird. The members of a colony (these birds are gregarious) construct a large mass of sticks and small twigs, within which they build their nests. Dr. Abbott collected skeletons and specimens in alcohol, to serve as a basis for further investigations into the affinities of the family.

The series of birds totalled about two hundred and fifty specimens, of fifty or more species, over thirty of which are peculiar to the island. The indigenous species of this island have long constituted the Museum's chief desiderata among the birds of the West Indies, hence Dr. Abbott's collection has proved of the greatest interest, aside from the special discoveries mentioned above.

CHAS. W. RICHMOND.

DREDGING FOR MARINE INVERTEBRATES OFF THE FLORIDA KEYS

In May 1916, Mr. John B. Henderson, a regent of the Smithsonian Institution, conducted a series of dredgings from his yacht *Eolis* off Key West, Florida. Owing to exceptionally good weather conditions and to the fact that the Gulf Stream had receded much farther off shore than is usual, the party was enabled to carry on most successful operations upon the Pourtales Plateau. This is a strip of rocky bottom off the Florida Keys extending some forty or fifty miles and lying between the depths of 100 to 200 fathoms. It is one of the richest localities in American waters with a fauna peculiarly its own. Owing to the great difficulty of dredging over the rocky floor swept by the maximum current of the Gulf Stream, but little attempt has been made to explore it since the work done there by Pourtales, fifty years ago. The material collected covers all groups of marine invertebrates.

COLLECTING IN WESTERN CUBA

In the last few years, numerous collecting trips to western Cuba have been made by Mr. Henderson, usually accompanied by some

member of the museum staff. During the course of these explorations, very large series of land shells have been secured, giving to the Museum by far the largest and most complete collections in the world of that exceedingly rich and interesting mollusk fauna. Practically the entire range of the Organos Mountains, the Sierras of western Cuba, had been explored by representatives of the museum, but there still remained untouched three localities of importance. These were, (1) the extreme eastern prolongation of the Sierra de los Organos, or that region known upon Cuban maps as "Loma de Cuzco" and "Guayajabon." This region furnished the types of several of the first described mollusks of Cuba but has



FIG. 40.—Mr. Henderson's yacht *Eolis* in Florida waters.
Photograph by Henderson.

been neglected by all subsequent collectors. (2) The region about "Rangel," one of the most famous of type localities in Cuba, and (3) that section of the Organos Mountains lying between Rangel and the Taco Taco River Gorge and the town of San Diego de los Baños.

In May and June, Mr. Henderson and Dr. Paul Bartsch, curator of marine invertebrates of the Museum, spent a month exploring these three regions. For most of the trips they were accompanied by Dr. Carlos de la Torre and Sr. Rodriquez of the University of Havana. The many localities and stations occupied were thoroughly collected and fine series of mollusks and other organisms were brought home.

Before returning, Mr. Henderson and Dr. Bartsch visited the "Luis Lazo" region in the extreme western part of the Sierra in order to supplement collections hurriedly made there several years ago.

With the completion of the last few items upon the comprehensive program of collecting in western Cuba, the Museum is now in possession of sufficient material for a thorough study of the special fauna of that exceedingly interesting region.



FIG. 41.—Bird Key Reservation, Tortugas, Florida. The large birds on the stakes are Man-o'-war birds; the white-crowned birds nesting in the bushes are Noddy Terns; the birds nesting in the open stretches on the ground are Sooty Terns. Photograph by Bartsch.

VISIT TO THE CERION COLONIES IN FLORIDA

Through the cooperation of the Carnegie Institution and the U. S. National Museum, Dr. Paul Bartsch, curator of marine invertebrates, was enabled to visit the Bahama Cerion colonies which he has planted on the Florida Keys, between Miami and the Tortugas, last May for the purpose of studying the effect of the changed environment upon these organisms. He reports the finding of many adult specimens of the first Florida grown generation, which together with those



FIG. 42.—Bahama Cerions grown on Loggerhead Key, Tortugas, Florida.
Photograph by Bartsch.



FIG. 43.—Least Terns on Loggerhead Key. Photographs by Bartsch.



FIG. 44.—Noddy Terns on Bird Key. Photograph by Bartsch.

found last year of the same generation, will furnish the basis of a report now in preparation.

No adult specimens of the second generation have as yet been obtained, although many immature individuals of it were observed, which should attain complete development during the year (1917). The results to be shown by this second generation, probably the most interesting one, are eagerly looked forward to.

An unlooked for result was obtained on New Found Harbor Key, where four hybrid specimens between the native *Cerion incanum* and the transplanted Bahama stock were obtained.



FIG. 45.—Mr. Bethel, the Bird Guardian on Bird Key. Photograph by Bartsch.

The Florida tree snails, *Liguus fasciatus*, transplanted from Brickles Hammock near Miami, to the grounds of the Commandant's residence at Key West, and Garden and Loggerhead Keys, Tortugas, have completely disappeared from these places, not even a trace of a shell being found, thus stamping the experiment a failure.

During the *Cerion* investigations, and while traveling on a slow train between Key West and Miami on June 24, Dr. Bartsch kept records of the birds observed. These are to be shortly published in the Year Book of the Carnegie Institution, as his fourth annual list of the birds observed in southern Florida. Eight species were added this year, which had not been previously noted, bringing the total so far seen to ninety-seven.

STUDY OF THE MARINE INVERTEBRATE FAUNA OF CHESAPEAKE BAY

The hydrographic and biologic study of Chesapeake Bay begun by the U. S. Bureau of Fisheries in 1915 was continued during the past year. On two of the cruises of the steamer *Fish Hawk*, used for these explorations, the U. S. National Museum had a representative aboard with instructions to give particular attention to the invertebrate fauna of the bay.

Mr. J. A. Mirguet was detailed for this work from April 20 to April 26, 1916, during which time dredgings were made at Stations Nos. 8497 to 8536 inclusive. A few of these dredgings were made in Lynnhaven Sound and in the vicinity of Cape Henry. The others were in various parts of the Chesapeake between the mouth and the Patapsco River. But little opportunity was afforded for collecting along shore, the only work of this kind being done during a brief visit to the shores of St. Mary's River and Buckroe Beach.

Mr. William B. Marshall was detailed to the *Fish Hawk* for similar work from July 12 to July 31, 1916. During this cruise, Stations Nos. 8593 to 8622 inclusive were investigated, extending from the mouth of the bay to above the Patuxent River. Near the capes the dredgings yielded rich returns, but the fauna appears to dwindle out to the northward.

On this cruise, many opportunities occurred for collecting along shore and in the inlets and back bays. Lynnhaven Inlet and its shores, the shores of Fisherman's Island and at New Point, Cedar Point, and Solomon's Island were carefully examined. Lynnhaven Inlet yielded some fine material and interesting data. At Cedar Point a fresh-water lake of many acres in extent comes to within a hundred feet of the bay, above which its banks are elevated but a few feet. A small mollusk (*Amnicola*) is abundant in the floating vegetable matter and seems to be the only molluscan life occurring in the lake.

With a small dredge operated from a motor-boat, five or six hauls were made in Magothy Bay at depths of from 20 to 32 feet. The fauna proved to be very rich, probably owing to the narrow channel and fair current and the clean shores and flats covered with sea-grass. Unfortunately the netting of the dredge was carried away by the weight of a mass of coral. Having no means of making repairs, the party returned to the ship which then moved to another station, leaving the investigation of Magothy Bay unfinished.

EXPEDITION TO SOUTH AFRICA FOR LIVING ANIMALS

For some years past the National Zoological Park, in common with other similar institutions in the United States, has felt the effect of conditions that operated to hinder more and more the importation of wild animals from abroad and to reduce the supply. While various causes contributed to this, the regulations designed to prevent the introduction of infectious diseases of animals into the United States, have until very recently had most effect. Deer, antelopes, camels, and all other ruminants, also swine, have long been forbidden entry into the United States when coming from the continent of Europe; and for several years past a quarantine has been in effect much of the time against Great Britain because of outbreaks of foot-and-mouth disease there. The same is true of South America; and the restrictions against Africa and Asia are only a little less stringent. With ruminants already almost unobtainable, the outbreak of the European war cut off practically all of the established means of supply for other animals, as the business had been almost wholly in the hands of German dealers.

That this situation was likely to bring serious trouble was soon realized by those having collections of living animals to maintain, and they began to take counsel together. At the suggestion of Dr. W. T. Hornaday, Director of the New York Zoological Park, a conference was held at the Philadelphia Zoological Garden to consider the question of sending a joint expedition, on behalf of the New York, Philadelphia, and National Zoological Parks, to South Africa for animals. From correspondence which Dr. Hornaday submitted at this conference it appeared that some desirable animals were then being offered at a South African port, and that a fairly good representation of the rich fauna of that region would be available if a reliable market were assured. A line of steamships had recently been put in operation between African ports and New York, so that direct shipment could be made. Altogether the conditions seemed reasonably favorable, and it was decided to send a man out to look the ground over, see what could be done in the way of arranging for a supply of animals for the future, and bring back anything desirable that could be secured at the time. As no one of the three institutions could spare a suitable man for this work, they engaged Mr. J. Alden Loring, who had been successful in bringing animals from Europe for the New York Zoological Park, and had also had experience in Africa as a member of the Smithsonian expedition to East Africa.

Mr. Loring sailed from New York July 22, 1916, taking with him hay and grain enough to feed as many antelopes and other

herbivora as he was likely to obtain, for one of the conditions necessary to secure their entry into the United States was that no forage from Africa should be brought with the animals. He arrived at Port Elizabeth, South Africa, August 31, and, returning, sailed from Durban November 22.

The opportunities for securing animals to bring back were found to be in some respects less favorable than had been anticipated. Business conditions generally had been disturbed by the war, and animals were no longer being captured and held for sale to the traveling buyers for European dealers, who, it was known, would now be unable to come. Most of the few animals that had been



FIG. 46.—Herd of sable antelope brought in by the hunters. National Zoological Gardens, Pretoria, South Africa.

available were bought and taken away by a private buyer who passed through the region not very long before Mr. Loring arrived. Fortunately the zoological garden at Pretoria was fairly well stocked, and the director was kind enough to deplete the collection somewhat for the benefit of his distant colleagues. Most of the animals which Mr. Loring brought back were obtained there, an interesting collection of mammals and birds being secured. Two nice lots of snakes and tortoises were obtained elsewhere. There was practically no loss during transportation except a koodoo which broke its neck soon after being put in the shipping crate. The voyage from Durban occupied forty-one days, from November 22 to January 2, and on arrival at Boston the animals were immediately transferred by express to the New York Zoological Park, where

the ruminants were held in quarantine for fifteen days, under the supervision of an inspector of the United States Bureau of Animal Industry. The mammals obtained include a gemsbuck, a blessingbuck, a white-tailed gnu, a nilgai,¹ four springbucks, a pair of duikers, a pair of meerkats, and a few monkeys and rodents. Among the birds are two secretary vultures, a bateleur eagle, a hornbill, francolins of several species, a few touracous and hawks, and a number of smaller birds. The collection has been divided between the three institutions concerned, according to their choice, and in proportion to the share of the expenses that was borne by each. Altogether



FIG. 47.—Yards for antelope, National Zoological Gardens, Pretoria, South Africa.

there were secured 28 mammals, representing 13 species; 60 birds, of 25 species; and 55 snakes and tortoises, of 8 species.

It may be of interest to give a brief abstract of Mr. Loring's notes regarding the zoological gardens which he visited in South Africa, where this feature of municipal life seems to find favor.

Cape Town has a small collection of animals, including lions, antelopes, and various smaller mammals, and some birds. This is on the Cecil Rhodes estate.

Durban, with a population of some 34,000, has a small site and a small collection, with apparently not much popular support.

¹ An Indian antelope, born in the Pretoria Zoological Garden.

Bloemfontein, of about the same size, is developing a very creditable zoological park.

Johannesburg, with a (white) population of more than 250,000, has a zoological garden that is the second in importance. It occupies a large, well-wooded site, and its animals are in good condition.

The garden at Pretoria is the largest and best. The animals are in clean, spacious cages and inclosures, and are in fine condition. The garden is favorably located on a well-watered and wooded site, and is supported in part by the Government. It has long had a high reputation for attractive appearance and interesting exhibits, and



FIG. 48.—Flight cage, National Zoological Gardens, Pretoria, South Africa.

its director, Mr. A. K. Haagner, is well known as a contributor to knowledge of South African animals. He is anxious to establish direct relations with institutions in this country which will secure for Pretoria a supply of American animals and enable him to find place for African animals, of which the Pretoria Garden can arrange to furnish many important and most desirable species.

A. B. BAKER.

BOTANICAL EXPLORATION IN VENEZUELA

Dr. J. N. Rose, associate curator of plants in the National Museum, accompanied by Mrs. Rose, carried on exploration work in Venezuela during October and November, 1916, on behalf of the Carnegie



FIG. 49.—Royal Palms along road north of Caracas, Venezuela. Photograph by Mrs. J. N. Rose.



FIG. 50.—View of harbor at Willemstad, Curaçao, showing the Governor's Palace in the distance and the pontoon bridge which closes the mouth of the harbor to the left. Photograph by Mrs. J. N. Rose.



FIG. 51.—A mountain view between LaGuaira and Caracas, Venezuela. Photograph by Mrs. J. N. Rose.



FIG. 52.—Governor's Palace, Willemstad, Curaçao. Photograph by Mrs. J. N. Rose.

Institution of Washington. Both on his way to and from Venezuela stops were made at Curaçao, where opportunity was given to study the very interesting Cactus flora of this Island. The people of Curaçao make very substantial baskets out of the mangrove, which is so common in all tropical coastal thickets. It is rather surprising that this plant is not more extensively used for this purpose in other countries.

In Venezuela Doctor Rose made extensive collections, especially



FIG. 53.—Market scene at Caracas, Venezuela.
Photograph by Mrs. J. N. Rose.

in the mountains about Caracas and Puerto Cabello. While the purpose of his visit to Venezuela was to study the Cactus flora, he obtained also plants in many other groups, especially the Orchids. Through the cooperation of Mr. Homer Brett he secured for the Museum specimens of "Sabadilla." Very much has been written and said about this plant during the past two years, as it is a source of one of the asphyxiating gases which has been used in the European war. At the present time it is listed as a contraband of war by the British Government.

BOTANICAL EXPLORATIONS IN FLORIDA AND NEW MEXICO

During February and March, 1916, Mr. Paul C. Standley, of the division of plants, National Museum, spent about three weeks in the vicinity of Fort Myers, Lee County, on the west coast of southern Florida. Although the trip was a private undertaking, most of the time was spent in an investigation of the interesting flora of the region.

This part of Florida is remarkable for its uniformly level surface, lying only a few feet above sea level, the soil consisting of almost pure white sand, with scarcely any humus, underlain by beds of marl. Rock exposures are infrequent and are confined chiefly to the banks of the small streams. The two most conspicuous plants are a large pine (*Pinus caribaea*) and the saw palmetto (*Serenoa serrulata*). The former is a large tree, occurring everywhere in uniform, rather sparse stands. The saw palmetto is a palm, forming large dense patches two or three feet high almost throughout the pine woods. On close inspection the palmetto is seen really to be a tree or shrub, whose branching trunk is prostrate upon the surface of the soil and rooted to it. With these two plants are associated many kinds of herbs and low shrubs, some of them with very handsome flowers. Coarse grasses and sedges are very abundant.

The pine woods are interspersed with numerous cypress swamps of varying extent, shallow depressions into which the surface water drains, remaining for most of the year. The vegetation here is quite different from that of the sandy soil. The largest and by far the most abundant tree is the cypress, but it is accompanied by many shrubs and small trees, such as ash, maple, elm, holly, wild fig, custard apple, and numerous others less widely known, which are characteristic of subtropical regions. The wild fig is one of the most interesting plants of these swamps: commonly it is a shrub, but often it is a climber, with a long, slender, whitish, rope-like stem which ascends the cypress trees by means of aerial roots, sometimes to a height of sixty feet or more. The trees of the cypress swamps support a varied and often dense growth of epiphytes or air-plants, chiefly ferns, Spanish moss, bromeliads (*Tillandsia* spp.), and orchids. Some plants which farther north are terrestrial become epiphytes in these swamps. Numerous species of herbaceous plants line the margins of the swamp ponds or "lakes," as they are known locally, which are frequented by flocks of water birds, and by many alligators and other reptiles.

Fort Myers lies only about fifteen miles from the Gulf, and the small streams in the vicinity, as well as the large Caloosahatchee

River, are under the influence of the tides. Their banks are bordered with mangroves and other halophilous trees and shrubs. In many



FIG. 54.—Fort Myers, Fla. An air-plant (*Tillandsia* sp.) growing on a cypress trunk, with Spanish moss (*Dendropogon usneoides*).



FIG. 55.—Fort Myers, Fla. A fern (*Blechnum serrulatum*) growing upon the base of a cypress tree.

localities a conspicuous feature of the vegetation is the cabbage palmetto, a tall, handsome palm with a large tuft of leaves, the "cabbage" of which is used for food.

The town of Marco, about 40 miles farther south on the Gulf, was visited also, for the purpose of collecting plants. Marco is



FIG. 56.—Fort Myers, Fla. Scene in a cypress swamp during the dry season. Numerous epiphytic plants are seen on the tree trunks.



FIG. 57.—Fort Myers, Fla. A saw palmetto (*Serenoa serrulata*). The prostrate trunk, covered by old leaf bases, is seen at the left.

noteworthy because of the large shell mounds of the vicinity, the refuse from the shell-fish used as food by the early Indian inhabi-

tants. The vegetation here is much more tropical than that about Fort Myers and the mounds have a characteristic association of



FIG. 58.—Fort Myers, Fla. A tree in a cypress swamp covered with epiphytic plants, including several species of ferns and bromeliads (*Tillandsia* spp.).

plants. Coconut palms are common along the shores, sometimes forming large groves.

During the three weeks spent in Lee County, about 700 specimens of plants were collected, representing some 500 species. Many of them are plants of rare occurrence, and some represent notable extensions of range, one, at least, being an addition to the known flora of the United States. One of the lichens was determined by Mr. G. K. Merrill as a new species, and some of the parasitic fungi are of unusual interest.

During August and September Mr. Standley was detailed for field-work in New Mexico. He spent four weeks at Ute Park, Colfax County, a locality in the southern extension of the Sangre



FIG. 59.—Ute Park, N. Mex. Showing sandstone hillsides covered with pinyon and cedar.

de Cristo Range of Colorado, and only a few miles south of the Colorado boundary.

Ute Park lies at an altitude of about 7,500 feet upon the Cimarron River, one of the characteristic swift, clear streams of the Rockies. The valley here is rather wide, with gently sloping meadows on one or both sides, although at some places the stream is shut in by cliffs which rise precipitously on both banks. Immediately along the stream and its tributaries are groves of cottonwood, with thickets of alder, aspen, birch, hawthorn, and other shrubs. The stream is inhabited by large numbers of beaver, whose dams are found everywhere. In places fully half of the trees seemed to have been cut down by these animals, to be used as food or in the construction of their dams.

Beyond the stream banks the meadows extend for varying distances. They are characterized by numerous grasses, especially blue grama, and by many showy-flowered herbs which exhibit a wealth of color found only in mountains at high altitudes. Beyond the meadows on one side rise low sandstone mountains covered with cedar and pinyon, and with many characteristic southwestern plants, such as cacti, yuccas, and bear grass. On the other side of the valley rise high mountains of igneous origin, covered with typical Rocky Mountain forests of yellow, white, and foxtail pine, Douglas and other spruces, fir, and aspen. One of the common trees is the cork-bark fir (*Abies arizonica*), a comparatively little known tree, whose

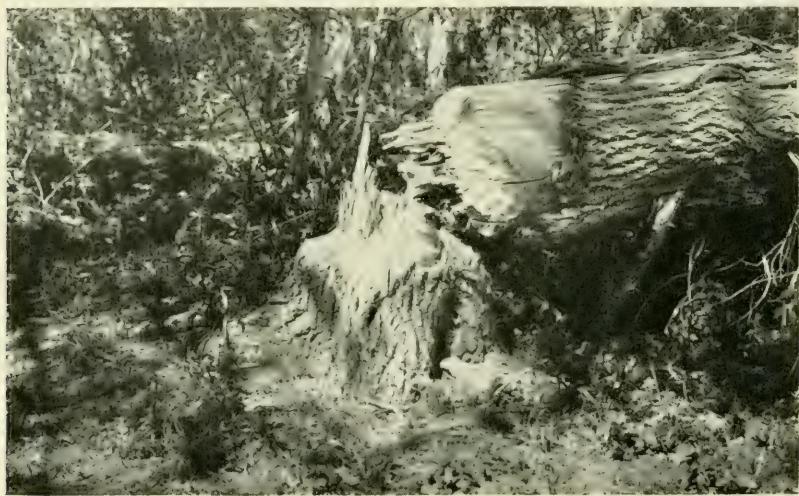


FIG. 60.—Ute Park, N. Mex. Cottonwood tree felled by beavers. The largest trunk felled in this manner was slightly over 2 feet in diameter.

bark, instead of being thick and hard, as in most of the conifers of the region, is soft and thin. After the trees have been dead for some time the bark separates from the wood in great cork-like sheets.

The highest mountain in the vicinity of Ute Park is Baldy Peak, which rises to 12,490 feet. Its top is well above timber line and supports an Arctic-Alpine vegetation.

During the time spent in the region about 5,000 specimens were secured, representing 1,540 collection numbers. Among the flowering plants several genera new to the State were obtained, and many additional species. Special attention was devoted to the cryptogams, and the collection of these is by far the largest ever obtained in the

State. Nearly one hundred rusts were obtained and about 250 collections of fleshy fungi, a group of which scarcely more than a dozen species have been reported from New Mexico. Probably more than 300 species of fungi have been added to the known flora of the State as a result of the expedition.

BOTANICAL EXPLORATIONS IN THE HAWAIIAN ISLANDS

During the summer of 1916, from June to November, Mr. A. S. Hitchcock, systematic agrostologist in the Department of Agriculture and custodian of the section of grasses of the division of plants in the National Museum, traveled in the Hawaiian Islands studying and collecting the flora, especially the grasses. Mr. Hitchcock was assisted by his son, A. E. Hitchcock. The islands visited were Kauai, Oahu, Lanai, Molokai, Maui, and Hawaii, these comprising all the islands of the main group except the two small ones Kahoolawe and Niihau. The islands are all of volcanic origin and the rock is lava except a very little that is coral formation. Kauai, the geologically oldest island, shows the greatest effect of erosion, the deep canyons rivaling in beauty the Grand Canyon of the Colorado. The rainfall on the mountains of the windward side is excessive, that of Waialeale, the highest peak of Kauai, being as much as 600 inches per annum. The lee side of the islands is arid, the rainfall being often reduced to less than 15 inches per annum. The islands to the south are successively younger, Hawaii, the largest, being now in a state of volcanic activity. On this island are the two highest peaks of the group, Mauna Kea, 13,825 feet, and Mauna Loa, 13,675 feet in height. Above 10,000 feet there is scarcely any vegetation upon these peaks, especially upon Mauna Loa which is made up of comparatively recent lava. There is much snow upon the peaks in winter and extensive banks persist throughout the year. The magnitude of the mountain mass is greater than at first appears, because the cones arise from the floor of the ocean 18,000 feet below the surface, thus making the total height over 30,000 feet. The gradual slope from the sea to the summit deceives the eye and the great height is not at first fully realized. Upon Hawaii is the active volcano Kilauea (4,000 feet) with its pit of boiling lava. What is said to be the largest crater in the world (Haleakala) is upon Maui, the second largest island of the group.

The important agricultural industries of the islands are sugar, live stock, and pineapples. The native Hawaiian population is decreasing. It is only in the less accessible parts of the islands that



FIG. 61.—A deeply eroded canyon of the Waimea River, Kauai.



FIG. 62.—A view of Mauna Kea near timber line. The small trees in the middle distance are mamani (*Sophora chrysophylla*). The grass in the foreground is *Koeleria glomerata*. Mauna Loa is seen in the distance. A cloud bank lies between at the left.



FIG. 63.—Near summit of Mauna Kea. Cinder cones in the distance. Snowbank in the foreground about 6 feet high (August).



FIG. 64.—A view in Haleakala crater showing the numerous cinder cones within the main crater.

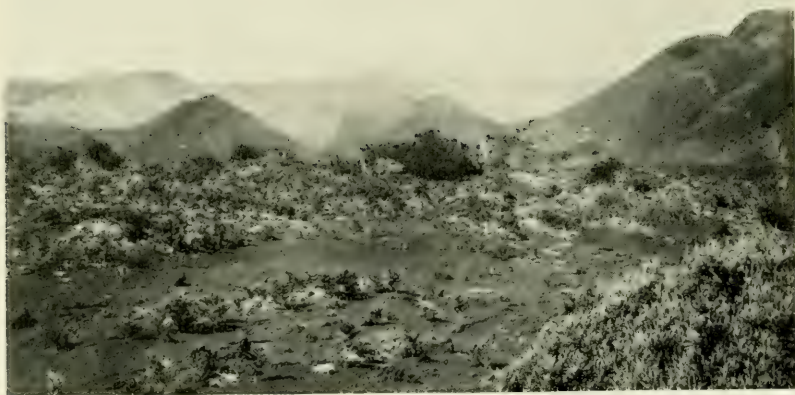


FIG. 65.—A view in the eastern part of Haleakala crater, looking west, two cinder cones in the center.

the primitive customs still prevail. Here may be found the grass huts of the natives. These huts are made of a frame work of wood filled in with a thatch of grass. The grass used for this purpose is usually pili (*Heteropogon contortus*), an indigenous grass abundant upon the rocky soil of the lowlands.

The cultivated trees and shrubs are of great variety and beauty, and are drawn from all tropical and subtropical lands. The introduced flora is very pronounced in the region of the towns, ranches, and plantations. One must go several miles from Honolulu to find indigenous plants. Of 60 species of grasses found on Oahu about 50 were introduced. One of the introduced trees of great economic



FIG. 66.—View in the garden in Honolulu, formerly owned by Dr. William Hillebrand, author of "Flora of the Hawaiian Islands," showing a tropical tree with brace roots.

importance is the algaroba tree, or kiawe, as the Hawaiians call it (*Prosopis juliflora*). It is found in a belt on the lowlands along the shores of all the islands and occupies the soil almost to the exclusion of other plants. The pods are very nutritious and are eagerly eaten by all kinds of stock. The flowers furnish an excellent quality of honey. The Molokai ranch produces 150 to 200 tons of strained honey per year. The prickly pear cactus (a species going under the name of *Opuntia tuna*) has become extensively naturalized in the dryer portions of all the islands. The ranchmen utilize this for feed when other kinds become scarce, the cattle eating the

succulent joints in spite of the thorns. Two introduced shrubs now occupy extensive areas and have become great pests. These are guava (*Psidium guajava*), whose fruit furnishes the delicious guava jelly, and lantana (*Lantana camara*), with clusters of handsome part-colored flowers. In the moister portions of the islands large areas have been occupied by Hilo grass (*Paspalum conjugatum*) which has little value as a forage plant. The kukui or candlenut tree (*Aleurites moluccana*) with its light, almost silvery, green foliage is now a common and rather striking element in the valleys and gorges.



FIG. 67.—A forest of algaroba trees (*Prosopis juliflora*). The pods are much relished by stock and are an important cattle food. From the flowers are produced an excellent quality of honey which is an important article of export.

The indigenous flora is highly interesting though not abundant in species. Two of the commonest trees are the ohia (*Metrosideros polymorpha*) and the koa (*Acacia koa*). The former, also called ohia lehua and lehua, resembles, in the appearance of the trunk, our white oak, but bears beautiful clusters of scarlet flowers with long-protruding stamens. The koa produces a valuable wood much used in cabinet making, now becoming familiar through its use for making ukuleles. Characteristic of the upper forest belt on the high mountains of Hawaii is the mamani (*Sophora chrysophylla*), a leguminous tree with drooping racemes of yellow flowers and long 4-winged



FIG. 68.—Trees on the windward side of Lanai, showing the effect of the strong trade wind.



FIG. 69.—Grass hut of the Hawaiians. The wooden framework is thatched with pili grass (*Heteropogon contortus*).

Pods constricted between the seeds. In the arid regions is found the wiliwili (*Erythrina monosperma*), a deciduous tree with gnarly growth, a very soft light wood, and bright scarlet seeds. Among the peculiar plants of the islands is the silversword (*Argyroxiphium sandwicense*), a strikingly beautiful composite with glistening silvery leaves, which grows only on the slopes of cinder cones in the crater



FIG. 70.—Palms at Hilo. Two royal palms with a slender betel palm between.

of Haleakala and in a few very limited localities on Hawaii. The family Lobeliaceae is represented by about 100 species belonging to 6 genera. The numerous arborescent species are very peculiar and characteristic. Many of them form slender trunks like small palms, crowned with a large cluster of long narrow leaves. The trunks of some species are as much as 30 or 40 feet high and the large bright colored flowers are sometimes remarkably beautiful.

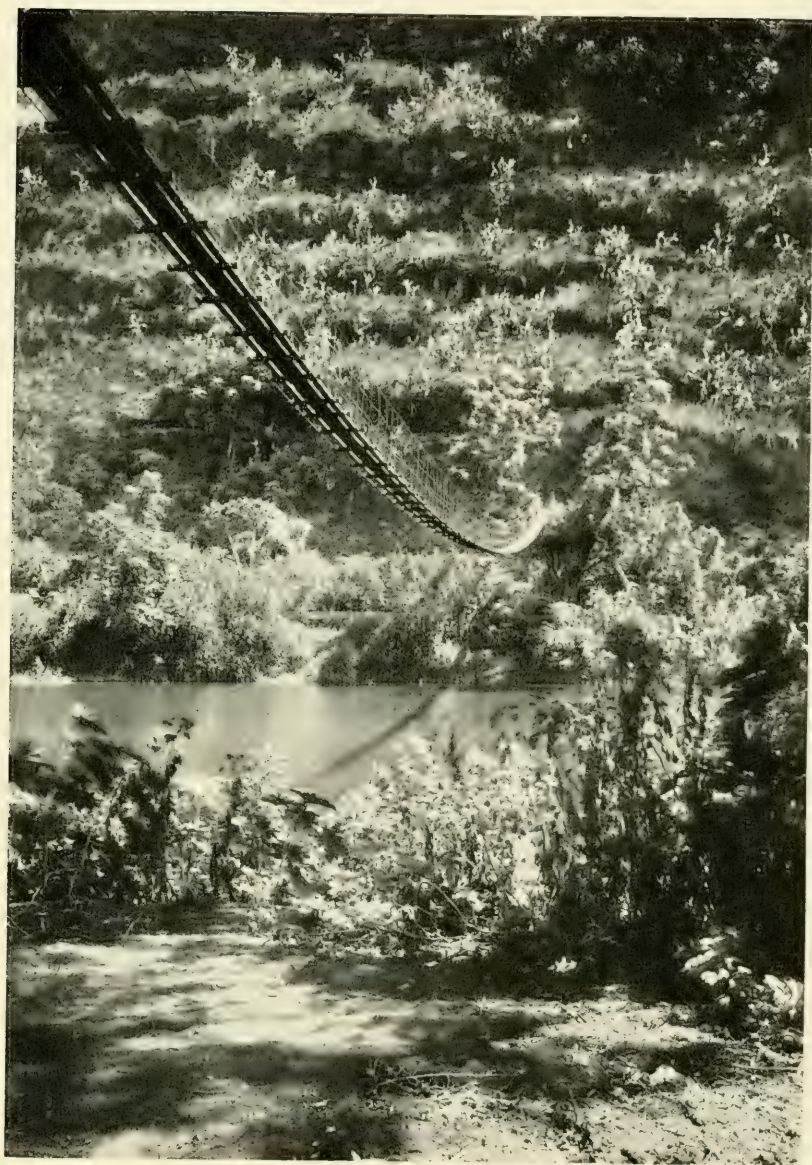


FIG. 71.—A foot bridge across the Waimea River, above Waimea, Kauai. On the opposite cliff are seen numerous plants of prickly pear cactus (the so-called *Opuntia tuna*).



FIG. 72.—Trunk of a large koa tree (*Acacia koa*), on the eastern slope of Mauna Loa, Hawaii. A valuable wood much used in cabinet making, especially for ukuleles.

The indigenous grasses of the Hawaiian Islands are not numerous. The most interesting belong to the genera *Panicum* and *Eragrostis*. A tall species of the latter (*E. atropioides*) is the dominant grass upon the plain between Mauna Loa and Mauna Kea. Three peculiar



FIG. 73.—Wiliwili (*Erythrina monosperma*), in an arid gulch on the western part of Molokai. At this season (October) the tree is devoid of leaves. Flowers and pods may be seen at the extremities of the branchlets.

species of *Panicum* inhabit the open bogs formed on the tops of many of the high mountains in the wet zone such as Mt. Eeka and Mt. Kukui in West Maui, some of the peaks of Molokai and Oahu, and Waialeale in Kauai, that upon the latter covering in all several



FIG. 74.—The silver sword (*Argyroxiphium sandwicense*), growing on cinder slopes in the crater of Haleakala, East Maui, at an altitude of about 9,500 feet.



FIG. 75.—A tree fern (*Cibotium menziesii*) near Puu Waawaa, Hawaii. The undergrowth is a common fern (*Dryopteris fuscoatra*) found in much of the wet forest at an altitude of 3,000 feet.

square miles. These bogs are found near the summits of ridges in the regions of heavy rainfall, are devoid of trees and shrubs, and harbor a peculiar vegetation. Many species form more or less globose tussocks which rise above the general level of the bog. The most interesting of these tussock plants are a sedge



FIG. 76.—A representative of the peculiar arborescent lobelias (*Cyanca* sp.). Forest near Kaholuamano, Kauai.

(*Oreobolus furcatus*) and the three species of *Panicum* mentioned. The panicums form close masses, the interior consisting of many generations of dead leaves and stems, scarcely decayed, the exterior consisting of short living shoots an inch or two long, with a few contiguous ovate blades and reduced panicles of one to a few spikelets. A showy lobelia (*L. gaudichaudii*) with numerous large



FIG. 77.—Bracket fern (*Elaphoglossum acmulum*) growing on ohia (*Metrostideros polymorpha*). The branching trunk of the latter is common and is probably due to the fact that the early growth was upon some other tree and these roots were thrown down to the ground for support.

cream-colored flowers as much as $3\frac{1}{2}$ inches long, peculiar violets, and a sundew (*Drosera longifolia*) are found in these bogs.

The ferns of the Hawaiian Islands are numerous in species and individuals. They are the dominant feature of all the wet forests. Three species of tree ferns of the genus *Cibotium* are found and in some places form extensive forests. These produce at the base of the stipe a great ball of brownish-yellow wool called pulu by the natives and used by them for stuffing pillows and mattresses. One species (*C. menziesii*) is shown in figure 75. Contrasted with the tree ferns are numerous small epiphytic forms, some species with fronds only an inch or two long. The ferns and fern allies number about 170 species.

ARCHEOLOGICAL EXPLORATIONS IN GUATEMALA AND HONDURAS

In February, 1916, W. H. Holmes, head curator of anthropology, United States National Museum, had the good fortune to become a member of the Carnegie Institution's archeological expedition to Central America under the direction of Sylvanus G. Morley. Among the ancient cities visited was Antigua, the ancient capital of the Spanish kingdom of Guatemala during the period of its greatest prosperity and power. The splendor of its religious establishments is amply testified by the ruins of upwards of forty great churches now scattered through the modern Indian town which occupies the ancient site. The city was visited by a series of earthquakes during which the splendid structures were shattered or thrown down and it was found impossible to restore them and keep them in repair, and in desperation the capital of the kingdom was removed to a neighboring valley, to the site of the present Guatemala City.

The history of the Spanish capital city and its great buildings proves most instructive to the student who would discover the causes that led to the downfall and destruction of the numerous cities built by the Mayan people in prehistoric times, the ruins of which are now found scattered over Central America.

The present Guatemalan capital is built on the site of one of these ancient cities represented to-day by numerous pyramids, terraces, and quadrangular enclosures as well as by works of sculpture which are scattered over a large area just outside of the limits of the capital city.

An extended visit was made to the ruined city of Quirigua in eastern Guatemala. This city has been the subject of much scientific interest during recent years and its remarkable sculptural and

architectural remains have been studied and described by numerous explorers, among whom are Stevens, Maudslay, and Hewett. Much of interest, however, still remains hidden away in the dense tropical forest. The sculptures found here are among the most important known products of aboriginal American genius, the most remarkable example being the "Great Turtle" or Dragon which will be described



FIG. 78.—Temples 20 and 22, Copan, showing the vast magnitude of the substructures. Courtesy of the Peabody Museum.

in detail in an article by Prof. Holmes in the general appendix of the Annual Report of the Smithsonian Institution for 1916.

From the city of Zacapa in Guatemala an excursion was made across ranges of rugged mountains into Honduras where the ancient city of Copan was visited and studied in as much detail as the limited duration of the visit permitted. The vastness of the pyramids, terraces, and courts, the grandeur of the temples and the marvelous



FIG. 79.—A colossal stela at Copan illustrating the remarkably deep and elaborate carving. Courtesy of the Peabody Museum.

sculptures, tell an eloquent story of the civilization and power of the ancient people.

Especial attention was given to the collection of data and drawings to be utilized in preparing panoramic views of the several cities visited, and every effort was made to obtain information regarding the technical methods employed by the ancient sculptors and builders. The quarries from which the stone was obtained were too deeply buried in tropical vegetation to yield up their story without extensive excavation and the methods employed in dressing and carving the stone remain in large part undetermined. Certain chipped and ground stone implements that could have served in dressing the stones used in building were found in numbers, but the story of the carving, especially of the very deep carving of the monuments of Copan, remains unrevealed. Although it is thought that stone tools may have been equal to the task, it is believed by some that without bronze the work could not have been done. There are, however, no traces of the use of bronze by the Central Americans.

PREHISTORIC REMAINS IN NEW MEXICO, COLORADO, AND UTAH

Dr. J. Walter Fewkes, of the Bureau of American Ethnology, spent a little less than five months in the field studying the remains of some of the prehistoric buildings scattered over western New Mexico and Colorado, and eastern Utah. The first month of that time he endeavored to increase our knowledge of the prehistoric migration trail of the Hopi fire people. The months of July, August, and September, were devoted to excavations and intensive studies of a ruined pueblo at Mummy Lake in the Mesa Verde National Park, Colorado. In October Dr. Fewkes investigated certain ancient towers above Hill Canyon, Utah, one of the most northerly localities in which these structures have yet been found.

The inhabitants of the Hopi villages in northeastern Arizona are recognized by ethnologists as a composite people, made up of several clans whose ancestors in some instances spoke different tongues, having drifted into this isolated region of waterless mesas from all directions. The descendants of these clans, some now already absorbed and their language assimilated, others, retaining their original speech and now a people of homogeneous culture, inhabit villages perched on high plateaus. The first colony, or the original

settlers, to arrive in this arid country, are said to have been immigrants from the east, or from the region now embraced in Colorado



FIG. 80.—Fire House, a former home of the Hopi Fire Clans.



FIG. 81.—Ruin near Crown Point, New Mexico. Photograph by Fewkes.

and New Mexico, where the peculiar buildings known as pueblos probably originated. These incoming clans of housebuilders forming

the nucleus of the Hopi population were augmented, in the seventeenth and eighteenth centuries, by additions from this and other directions.

The arrival in the Hopi country of the first clans occurred in prehistoric times, but legends of that event have been preserved in traditions which may be verified by examination and comparison of archeological data. It is possible by a study of the halting places mentioned in legends to determine the migration trails of these increments and to extend into prehistoric times our knowledge of the history of one of the most instructive groups of North American Indians.



FIG. 82.—Kin-a-a, near Crown Point. Photograph by Fewkes.

The ruin of Sikyatki, situated three miles from Walpi, is generally regarded as one of the oldest of the prehistoric Hopi settlements. All traditions and archeological evidences prove that it was settled before the Coronado expedition in 1540. Legends declare not only that the ancestors of this pueblo came from a region near Jemez, New Mexico, but also recount that before they built Sikyatki their ancestors constructed, on the brink of a canyon 25 miles east of Walpi, a village they called Fire House, the ruins of which (fig. 80), known to Navaho as Beshbito, "Pipe water," are still pointed out in support of this claim. These circumstantial statements can be verified or disproved by archeological observations on the ruin itself or by an examination of pottery found in it.

Doctor Fewkes, who has given much attention to the verification of similar Hopi migration legends by archeological data, took the field in June, having in mind to investigate evidences bearing on the



FIG. 83.—Kin-a-a, near Crown Point. Photograph by Fewkes.

Sikyatki legend. He began work with a visit to Fire House, the locality of which had previously been determined by Mr. Victor Mindeleff who described it in his valuable work on pueblo architec-



FIG. 84.—Far View House, northwest angle before excavation.



FIG. 85.—Far View House, north wall, partially excavated.
Photograph by E. E. Higley.

ture, published by the Bureau of American Ethnology. Doctor Fewkes found the architectural features of this ruin essentially the same as when visited by Mindeleff. The ground-plan of Fire House is exceptional in being circular, while that of Sikyatki appears to be rectangular. On the very threshold of the investigation this radical difference in form seemed to disprove the legend, but it is by no means disastrous to a theory of relationship of the two ruins. On the rim of the East Mesa, above Sikyatki, there stand two conspicuous conical mounds, which legends always associate with the village in the foothills. They are remains of the only circular pueblo



FIG. 86.—Northwest angle of Far View House. Dr. Fewkes in the foreground. Photograph by E. E. Higley.

ruins in the Hopi country, and were probably constructed by relatives of the emigrants from Fire House before they built the larger rectangular village at the foot of the Mesa.

The round form of Fire House has a still more important significance, for it corroborates the Hopi legends that their ancestors came from some place near Jemez, a pueblo situated in or near a zone of round ruins extending from southern Utah to the Zuñi River.

The pottery of Fire House is more instructive than its architecture, for its symbolism is the same as that characteristic of the zone of circular ruins. Its rude character and simple conventionalized figures, as compared with the fine specimens from Sikyatki, add

evidence to the theory that characteristic old Hopi pottery is a specialized type distinct from all others in the Southwest.

After having visited Fire House, Doctor Fewkes continued his investigations eastward from this place, still searching for archeological evidence of a possible trail of migration along which people may have left habitations in their travels before they built Fire House. He failed to discover any large pueblo ruins that can be attributed to the Fire clans, although he found many ruins scattered in the extensive interval between the site of Fire House and the next



FIG. 87.—Mummy Lake, Mesa Verde National Park.
Photograph by Mrs. C. R. Miller.

cluster of large ruins, or those of the Chaco canyon. The general character of these ruins does not resemble but is closely related to that of the ancient ruins in the Zuñi valley. A number of representative specimens of pottery collected in these same ruins, especially whole pieces from Black Diamond ranch, were brought to Washington, and were found to resemble those from Kintiel, a ruin situated 25 miles north of Navaho Springs. Kintiel was shown by Cushing to be a Zuñi ruin, and from his knowledge of Zuñi traditions he was able to enumerate the clans that once inhabited it.

After Doctor Fewkes examined, photographed, and roughly surveyed several of the ruins between Fire House and Crown point



FIG. 88.—Photograph of a model of Far View House, from southwest.



FIG. 89.—Far View House, from the south. Photograph by George L. Beam.



FIG. 90.—Southwest angle of Far View House, Mesa Verde National Park, Colorado. Photograph by W. H. Austin.



FIG. 91.—Tower near Spruce Tree House, Mesa Verde National Park, Colorado. Photograph by Fred Jeep.

(fig. 81), he reached the conclusion, from the resemblance of their pottery to Kintiel, that the majority of them belong to the Zuñi series, or were links, in a cultural chain, connecting the great Chaco ruins with those of the Zuñi valley, thus supporting by archeological evidence, the Zuñi legends that one or more of the Chaco ruins were once inhabited by Zuñi clans. Although not a novel suggestion, it is a significant one, as the fate of the inhabitants of these magnificent buildings is one of the unanswered problems of Southwestern culture-history.



FIG. 92.—Tower in Navaho Canyon, Mesa Verde National Park, Colorado. Photograph by E. E. Higley.

In pursuance of another archeological problem Doctor Fewkes was obliged temporarily to leave his studies of Hopi migration routes unfinished, and on July 20 began the extensive work of excavation and repair of a pueblo ruin in the Mesa Verde National Park, Colorado. This is a continuation of work in which he has been engaged at intervals for the last eight years for the Department of the Interior. The appropriation for work on Mesa Verde was exhausted at the close of September, obliging Doctor Fewkes to abandon the work. A report on this aspect of his summer's field operations has been transmitted to the Secretary of the Smithsonian Institution and will be published in the Smithsonian Report for 1916 under the title, "A Prehistoric Mesa Verde Pueblo and its People."

The plan of the work at the Mesa Verde was to excavate one of the many mounds situated on the top of the plateau for the purpose of discovering the characteristics of the Mesa Verde pueblos, of which formerly nothing was known. One of the most conspicuous



FIG. 93.—Tower in Navaho Canyon, Mesa Verde National Park, Colorado. Photograph by J. Wirsula.

piles of stones (figs. 84, 85, 86), in a cluster of 16 mounds near the reservoir called Mummy Lake (fig. 87), was chosen for this purpose, and in this were uncovered the walls of a rectangular ruin, 113 feet long by 100 feet wide; once 20 feet high on the north side where

there were formerly three stories. Led by the distant outlook south of this pueblo, which will serve as a type of many others awaiting investigation, Doctor Fewkes has suggested the name Far View House (fig. 89). His excavations show that it was compactly built, without plazas; it contains about 50 rooms on the ground floor, and four ceremonial chambers, one of which, centrally placed, is 32 feet

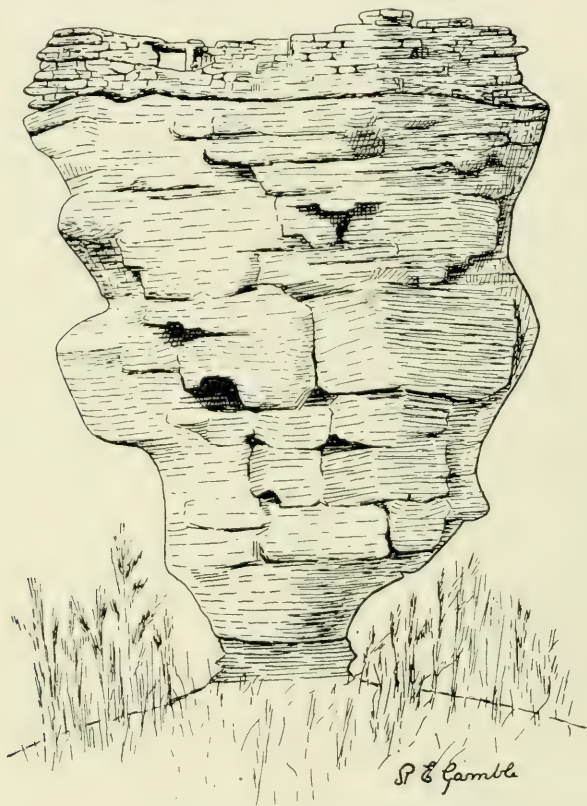


FIG. 94.—Mushroom Rock Ruin, Hill Canyon, Utah. Redrawn from a sketch made by the author on the spot.

in diameter (fig. 88). These last-mentioned rooms, known as kivas, are structurally identical with those of cliffhouses. They formerly had vaulted roofs, as indicated by pilasters erected around the room for support of the rafters, and a hatchway. Far View House (fig. 88) is not only a type of ruin hitherto unknown on the Mesa Verde, but also is important in comparison with the architectural features

of cliffhouses and pueblos throughout a region extending over one hundred miles from the Park in all directions. A considerable collection of objects, as pottery, stone and bone implements, idols and ornaments, illustrating the culture of the inhabitants of Far View

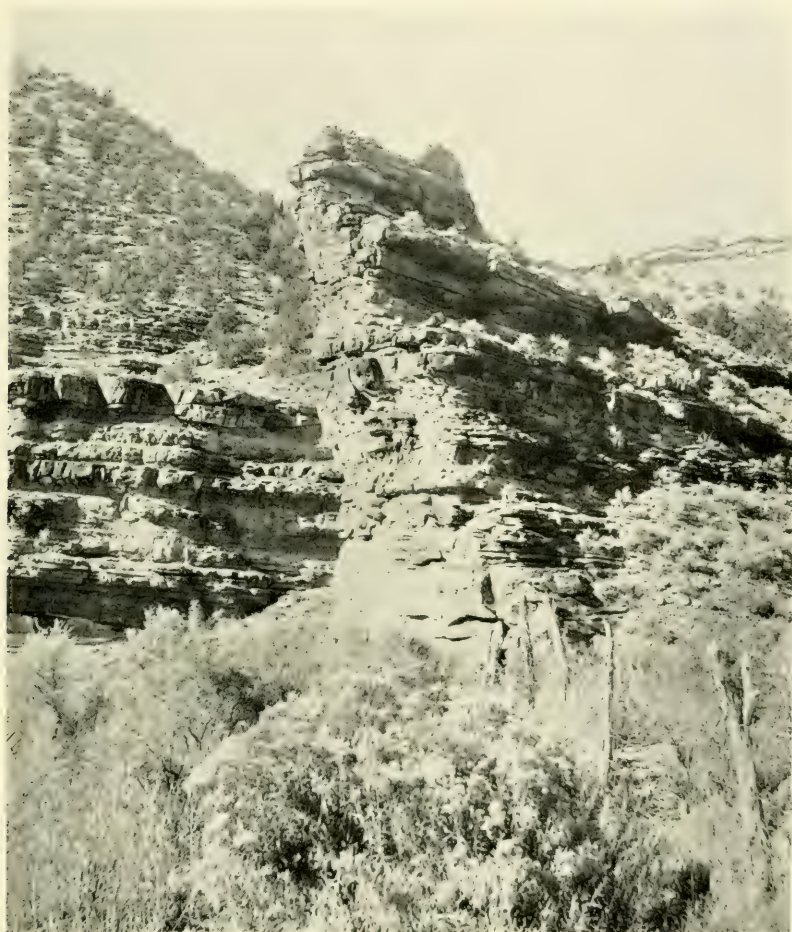


FIG. 95.—Leaning Tower Ruin, Hill Canyon, Utah.
Photograph by T. G. Lemmon.

House, was brought to Washington for future study. The collection is rich in incised designs on stone, spiral forms predominating.

One of the most striking forms of pueblo architecture in the Southwest is known as the tower. These buildings (figs. 91, 92, 93),

were first called to the attention of archeologists by Jackson and Holmes over 40 years ago, and are particularly abundant along the McElmo and its tributaries. The tower is not limited to this area, but is intimately associated with another widely distributed well-

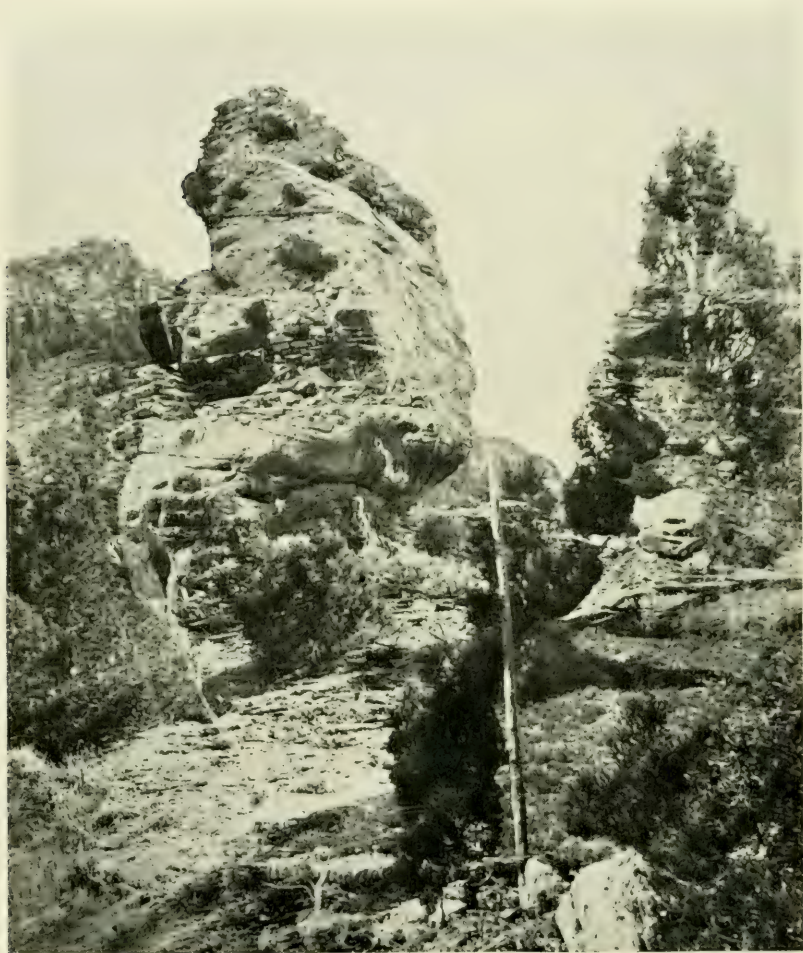


FIG. 96.—Pinnacle Ruin, McElmo Canyon, Colorado.
Photograph by T. G. Lemmon.

defined architectural type known as the circular ruin, which is most abundant in a narrow zone extending north and south, midway between eastern pueblos and the Hopi. There are important variations in the form of towers in different areas, and it is instructive

to determine the northern limit of this peculiar prehistoric structure. For this purpose Doctor Fewkes made a trip to Hill Canyon, 40 miles south of Ouray, Utah, having learned from Mr. Kneale, agent of the Ute, of hitherto undescribed ruins of unusual character in that neighborhood.

The ruins in Hill Canyon belong to the true tower type, but they were built at times on top of rocks of mushroom shape, which has led to the designation "Mushroom Rock ruins" (fig. 94), and seems to have placed them in another category. Several of these towers were photographed (figs. 95-97) by Mr. T. G. Lemmon, a volunteer associate, and the writer made sketches of the ground-



FIG. 97.—Eight Mile Ruin, Hill Canyon, Utah. Photograph by T. G. Lemmon.

plans of those he could enter. These observations not only add to our knowledge of the northern limit of the zone in which towers occur, but also introduce to the archeologist several striking forms bearing on important theoretical questions. So far as his observations on these hitherto unknown ruins have gone, Doctor Fewkes regards them as sacred buildings, comparable with the towers along the Yellowjacket, a branch of McElmo Canyon. They have all the appearance of tower kivas, sometimes single, more often in clusters, accompanied with rectangular buildings.

At the close of the work on Far View House, a trip was made from Mancos, Colorado, down the McElmo Canyon, to examine in a comparative way, towers, round, square, or semicircular, in Cannon

Ball and Ruin Canyons. The special object was to compare them with Sun Temple, a mysterious building uncovered last year (1915) on the Mesa Verde. The data obtained, too extensive to be here considered save in a general way, support the view, already published, that the tower is a type of kiva or ceremonial room.

ANTHROPOLOGICAL WORK AMONG THE SIOUX AND CHIPPEWA

Certain critical conditions among the Chippewa tribe and particularly that part of the tribe which occupies the White Earth reservation, have led during the year just past to anthropological work in this tribe, and among the Sioux, which proved not only highly desirable and interesting, but was followed so far as the Chippewa are concerned by certain very practical results.

The Chippewa tribe as a whole is considerably mixed with whites. Most of this mixture is of French origin, but that of more recent times includes different elements of whites now settled or employed in the country.

In behalf of the numerous mixed-bloods on the White Earth reservation, some of whom are well educated and self-supporting, the United States Congress in 1906-1907 enacted laws which made possible individual allotments of the tribal lands and permitted alienation of property. Some of the allotments were covered with valuable timber, while others were desirable on account of the rich soil, the proximity to lakes, or for other reasons. The majority of the Indians were poor, without knowledge of the value of their property or of the ways of white men, and with little or no protection. They became a rapid and easy prey of lumber companies and a multitude of land sharks, as a result of which, within a few years, hundreds of individuals, including full-bloods and minors, were pauperized, and the White Earth affair became one of the most shameful pages in the history of the white man's dealings with the Indian.

These facts are mentioned, however, only because they led to the anthropological study of the tribe. The frauds practised against the White Earth Chippewa became known to the Government, and a serious and prolonged effort was made by the Department of Justice to correct the evil. During the course of the last few years, more than fifteen hundred suits were filed against companies and individuals concerned in the frauds, and many of these could have been settled in justice to the Indian had it not been for the uncertainty respecting the blood status of many of those involved. Efforts were

made by the Government authorities, as well as by the opposing interests, to obtain a satisfactory genealogy of each Indian concerned, only to reach the conviction that such data could not be relied on to establish beyond legal doubt the full-bloodedness of any individual.

It was at this point that anthropology was appealed to, and the writer was intrusted with the examination of the White Earth Chippewa who claimed to be or were regarded as full-bloods, with the view of passing on their blood status. There were about 800 such



FIG. 98.—Two Sioux school girls, Standing Rock.

persons, 696 of whom were actually examined and their status determined.

In order to be fully prepared for this important work and to test certain new reactions bearing on the question of full-bloodedness of Indians, a most profitable month was spent among the Sioux along the Missouri, and some time was given also to the outlying parts of the Chippewa territory. This gave on one hand the opportunity to examine a good series of men and women among both tribes for anthropological purposes, while the additional experience gained



FIG. 99.—Chippewa mixed-bloods.

among the Sioux proved invaluable in the final work, so that it was not only possible to detect and separate all mixed-bloods from full-bloods, but to form some estimate of the proportion of white blood wherever mixture existed. Nevertheless, a number also were discovered of those who, so far as physical examination could show, were still genuine full-bloods.

The first report on the work among the Chippewa was published toward the end of the year;¹ while a report on the observations among the Sioux is in preparation.



FIG. 100.—Full-blood Chippewa women.

The study among the Chippewa reached the majority of the full-bloods still existing in that tribe. These full-bloods within a decade or two will have mostly if not entirely died out for with a few exceptions they are all old people. The observations and measurements of these full-blooded Chippewa showed the following main points:

In color, physiognomy, hair, and visible characteristics in general, the full-blood Chippewa were completely of the ordinary Indian type, showing no special features.

In stature they ranged from medium to tall, in body development from medium to stocky, the latter predominating.

¹ Hrdlička, Aleš, "Anthropology of the Chippewa," Holmes Anniversary Volume, Washington, 1916, pp. 198-227.

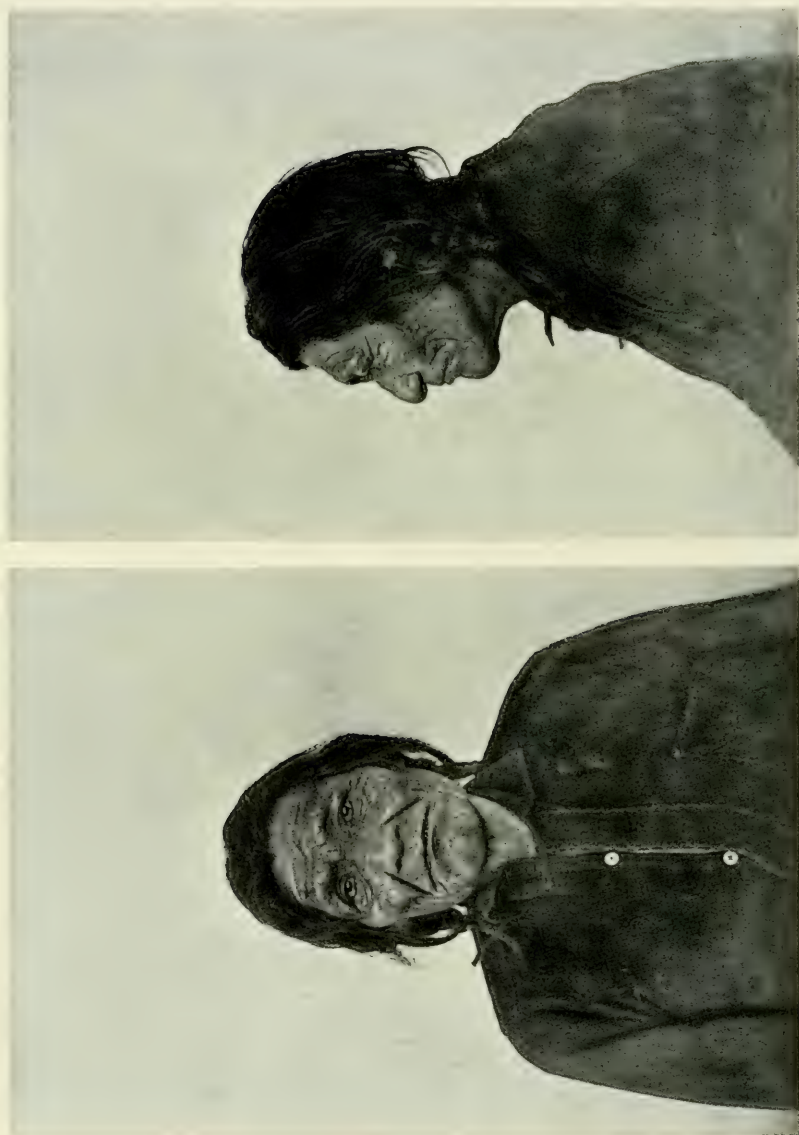


FIG. 101.—Full-blood Chippewa, Red Lake.

The head is large, predominantly mesocephalic, and of medium height. The face is both long and broad, the supraorbital ridges frequently pronounced, the forehead often more or less sloping, especially among the men, and often low in appearance, particularly among the women.



FIG. 102.—War Chief of the Twin Lake Chippewa.

The nose is of good size, with medium prominence, and differs considerably in shape; in men it is in half the cases more or less aquiline, in women mostly straight, concave, or concavo-convex. The septum is frequently horizontal or nearly so, especially in the females. The average nasal index is mesorhinic, as among the majority of Indians.

Alveolar prognathism in the average is slightly to moderately more marked than in whites; the lips in the majority of cases are of medium dimensions, comparable with those of whites, but occasionally the lower lip or both lips are slightly stouter; the chin and lower jaw are well though not excessively developed; the mouth is rather broad. The ears are large, as among Indians in general.



FIG. 103.—Wife of the War Chief of the Twin Lake Chippewa.

The tribe, though Algonquian in language and supposedly of eastern origin, shows a larger and relatively broader head, as well as a broader face, than most of the Eastern Indians. In these respects it is probably nearer some of the more central and northern Algonquian tribes, and as will be shown in a future report, it also approaches the Sioux fairly closely in some respects, though in the

latter the stature is still somewhat higher, the face larger, and the vault of the head lower.

The Sioux were found to be on the average even taller and stronger than the Chippewa. They are also characterized by the large size of the head as well as a large internal cranial capacity, equaling practically that of U. S. whites. But the skull is relatively low, which distinguishes it not only from the Algonquian but also from all the Plains tribes, and especially from the whites.

ALEŠ HRDLIČKA.

PRELIMINARY ARCHEOLOGICAL SURVEY OF LA POINTE ISLAND, WISCONSIN

In August, 1916, on the advice of Dr. Hrdlička, Mr. Philip Ainsworth Means, honorary collaborator in archeology, U. S. National Museum, visited La Pointe Island (now commonly called Madeline) with the intention of conducting archeological investigations on the site of the Ojibwa village on that island. The island is one of the archipelago known as the Apostle Islands, in Lake Superior. The Chippewa have occupied it since 1490. They lived there uninterruptedly until about 1620 when the place was deserted. In 1693 a French fort and an Ojibwa village were built on La Pointe Island and the site was occupied by the tribe with one or two interruptions until the nineteenth century.

There are thus on La Pointe Island two important and dated sites of occupancy by the Ojibwa, and the earlier of these sites with its accompanying cemetery dates from a period when no or but very little mixture with whites existed as yet in the tribe. This makes the site of the greatest importance for both the archeology and the anthropology of the Ojibwa who to-day, although one of the largest existing tribes, are also one of the most mixed. A careful and thorough exploration of this earlier site is one of the most urgent and promising tasks of archeology in this country.

A report on the preliminary survey of La Pointe Island by Mr. Means was published by the Smithsonian Institution.¹

ARCHEOLOGICAL INVESTIGATIONS IN NEW MEXICO

Dr. Walter Hough, of the National Museum, was detailed to the Bureau of American Ethnology in June to conduct archeological investigations in western central New Mexico. Proceeding to Luna,

¹ Smithsonian Misc. Coll., Vol. 66, No. 14.

Socorro County, Dr. Hough commenced the excavation of a ruin previously located by him, as described in Bulletin 35 of the bureau (p. 59). This site was thought to contain evidence of pit dwellings exclusively, and excavations showed that an area of about 40 acres contained circular, semisubterranean houses (fig. 104) in which no stone was used for construction. Seven of the pits were cleared, and it was ascertained that many more existed beneath the surface, dug in the yellow sandy clay substratum of the region. Burnt sections of roofing clay showed that these houses were roofed with beams, poles, brush, and mud, as in present pueblo construction. The roof was supported by wooden posts, charred remains of which



FIG. 104.—Showing circle of pit. Also showing the environs of the pit village beyond.

were found. Nothing was ascertained respecting the construction of the sides of the dwellings or in regard to the height of the roofs. On the floor of each of the pits uncovered were a rude metate (fig. 105), grinding stones, slabs of stone, and the outline of an otherwise undefined fireplace not quite in the center of the chamber. A bench about a foot high and a few feet in length was cut in the wall of some of the pits, and in one of the pits, against the wall, was a fireplace (fig. 106) with raised sides of clay.

Another type of structures adjoined the pits; these were rectangular, open-air houses with mud roofs, in which mealings and culinary work was carried on. Here were numerous metates, manos, rubbing

stones, pottery, etc.; some of the metates were set up on three round stones. Near the pit was a cemetery in which infants were buried,



FIG. 105.—Metate on floor of pit near fireplace.

the burials being associated with burnt clay hearths and much charcoal, and near the bodies were placed small pottery vessels. On the east of the village is a circular depression, 84 feet in diameter,

which was found to be a ceremonial assembling place. It was 10 feet deep and has been filled with about 6 feet of fine débris. Large



FIG. 106.—Fireplace in dwelling pit. Jambs of smoother baked clay, bottom a flat stone, hearth of baked clay.

pinus grow on the margin and in the depression. Scrapers of flint and bones of deer were also found among the burials. So far as ascertained, the people who used the circular semisubterranean houses

had a limited range. Traces of their culture have not been found below an elevation of 7,000 feet in the mountain valley, and it appears probable that their culture was associated with an environment of lakes which once existed in these valleys. It is evident in some cases that the pit dwellings were displaced by houses of stone. In most instances artifacts are different from those of the stone-house builders, and the latter have more points of resemblance to, than of difference from, the ancient inhabitants of Blue River. It is probable that the range of the pit-house people would be found to be more extensive by excavation around the sides of stone houses in other localities, the remains of pit structures being easily obliterated by natural filling. At this time the pit-dweller culture can be affiliated only with uncertainty with that of the ancient Pueblos. At the present stage of the investigation the lack of skeletal material is severely felt, but further work may overcome this difficulty.

ARCHEOLOGICAL RECONNOISSANCE IN WESTERN UTAH

In the last report¹ of the explorations and field-work of the Smithsonian Institution notice was given of the inauguration of an archeologic reconnoissance of western Utah, conducted under the auspices of the Bureau of American Ethnology by Mr. Neil M. Judd of the National Museum. During June, 1916, it was found possible to supplement this first survey, and Mr. Judd was again directed to proceed to Utah, there to engage in limited excavations in continuation of his previous work.

As observed in the report of last year, the mounds at Paragonah, in Iron County, represent but a small portion of the large number which formerly existed at that place; the recent reconnoissance was undertaken primarily for the purpose of gaining definite information regarding the remaining ruins before their final destruction was accomplished by removal of the elevations which concealed them. Limited in time and handicapped by unfavorable local conditions, the expedition was less successful than had been anticipated; the results obtained, however, establish a similarity between the ancient Paragonah habitations and those previously exposed in Beaver and neighboring valleys and tend to show that the builders of the western Utah ruins were more closely related to the house-building peoples of other sections of the Southwest than has been generally suspected.

One of the largest and at the same time one of the least disturbed of the Paragonah mounds was selected as a type for examination. Its dimensions were approximately 100 by 300 feet; its average

¹ Misc. Coll., Vol. 66, No. 3, 1915, pp. 64-71.

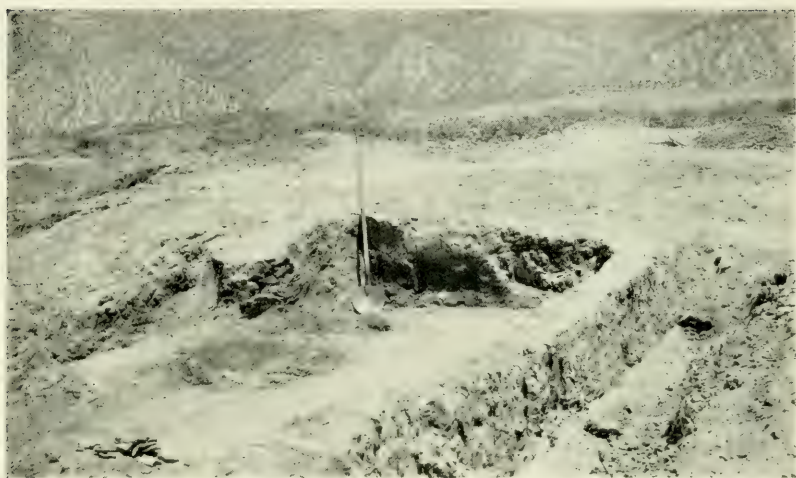


FIG. 107.—One of the ancient Paragonah dwellings. The adobe walls were of the same color as the surrounding soil and frequently were distinguished only by the small roots which followed their sun-dried surfaces.



FIG. 108.—Circular kiva or ceremonial room, Paragonah, Utah. Attempts to brace the thin earthen wall at the left had proved unsuccessful; its final collapse probably hastened the abandonment of the structure. Upon this sloping wall, near the end of the long shadow, is a fireplace which belonged to a temporary shelter, erected subsequently to the destruction of the kiva.



FIG. 109.—Ancient dwellings disclosed during the excavations of 1916. The circular fireplace above the wall in the immediate foreground belonged to a structure which was built upon the floor and which utilized the partially razed walls of a larger house.



FIG. 110.—A long room in the Paragonah mound. These walls had been exposed during previous excavations and were traced only with considerable difficulty.

height was less than 5 feet. Excavations of many years ago had left two great gashes, one at each end of the mound, each partially disclosing a single long room. Including these dwellings, which were reexcavated only with considerable difficulty owing to the hardness of the clay which had accumulated over them, Mr. Judd successfully revealed and measured the walls of 14 rectangular houses, 11 of which were entirely cleared of fallen wall material and other débris. In addition to these habitations less permanent structures were disclosed in various parts of the mound, situated between the ruins of larger houses and even above their razed walls. These temporary structures were built of logs leaned against cross-



FIG. III.—Interior of an ancient adobe dwelling, showing remains of a wattled partition constructed after completion of the house.

pieces supported by 4 upright posts surrounding a central fireplace and were of the same general character as those discovered in 1915 at Willard and Beaver City. They apparently represent the survival of an earlier type of habitation, preserved in association with the adobe houses as mere shelters wherein were performed most of the domestic activities of the community.

The characteristic ancient dwelling of this region was rectangular in shape; its vertical walls were constructed of superposed masses of plastic clay, forced into position and smoothed by the hands of the workmen. Lacking evidence to the contrary, it is believed that roof openings formed the only means of entrance to these houses, a belief substantiated by the very nature of the dwellings

and by the presence of numerous stone disks, in and about the mounds. The roofs were flat and, as in most primitive southwestern habitations, were oftentimes utilized as workrooms.

One of the most interesting discoveries made during the course of the Paragonah excavations was that of a circular room which, with similar remains previously discovered in the Beaver City mounds, tends to establish the use of the kiva, or ceremonial chamber, by the prehistoric house-building peoples of western Utah. The importance of this discovery is quite evident when one recalls that many of the clans composing the modern Pueblo settlements in Arizona and New Mexico constantly point to the north as the general



FIG. 112.—Walls of ancient adobe dwellings exposed at Paragonah, Utah, in 1916.

location of their ancestral homes. It is well known that many of these clans once occupied cliff-villages such as those so widely distributed throughout the upper San Juan drainage, villages in which the circular kiva reached its highest development. Students of southwestern archeology have labored many years with the problem of the origin of the cliff-dweller culture; the round rooms associated with villages of detached adobe houses in western Utah, together with the artifacts recovered from such houses, suggest that a solution of the problem may yet be found in the unknown canyons north and west of the Rio Colorado. It is earnestly hoped that the reconnaissance of western Utah may be concluded in the near future in order that the information resulting therefrom may be used in correlation

with archeological data now available from other sections of the Southwest.

Following his studies at Paragonah, Mr. Judd proceeded to Fillmore, Willard County, for the purpose of investigating certain mounds reported from that neighborhood. These and similar elevations near the villages of Meadow, Deseret, and Hinckley, were all superficially identified as of the same type and representing the same degree of culture as those previously described near Beaver City, Paragonah, and other settlements.

STUDY OF INDIAN MUSIC

During the summer of 1916 Miss Frances Densmore continued the study of Indian music, making phonographic records of Indian songs on the reservations. For this purpose she revisited the Uintah and Ouray reservation in northeastern Utah, to complete the study of Ute music commenced in 1914. The work at that time was limited to the Uintah and White River divisions of the tribe, but during the last season it was extended to the Uncompahgre. On comparing the two sets of songs it was found that those recorded by the Uncompahgre differ slightly in structure from those recorded by the Uintah and White River Ute.

The principal subjects of investigation among the Ute were the songs used in the treatment of the sick, the war songs, and those of tribal dances. Among the most valuable songs are those of a certain medicine-man who represented a class that treat the sick without the use of material means and who stated that he received his songs supernaturally and could not transfer them to another. Songs were also recorded by a woman who was actively engaged in treating the sick and who belonged to the class of those who use herb-medicines. Her power was believed to be supernaturally given, its source being an eagle. Songs of this class of "doctors" are usually received in a supernatural manner but may be bought and sold, together with the herbs which, it is believed, would be ineffective without the singing of the songs.

The Bear dance is the most distinctive dance of the Ute, and many songs of this dance were recorded. The Ironline dance and the Double dance are among the more or less unusual dances studied. These dances have long since passed into disuse.

A peculiar war custom of the Ute is that of "washing the wounded." It was said that "when a war party returned with a wounded man they placed him in the center of the circle as they



FIG. 113.—Ute burial ground. Photograph by Miss Densmore.



FIG. 114.—Man weaving net for trapping rabbits.
Photograph by Miss Densmore.

danced. Someone washed his wounds and all the warriors sang. The same songs were used if a man had been killed and his body placed in the center of the circle." Several of these songs were



FIG. 115.—Woman with baskets for gathering berries.
Photograph by Miss Densmore.

recorded, together with scout songs and those connected with an attack upon the enemy.

A burial ground in recent use was visited. On the burial places were scattered the bones of horses and dogs slain at the death of their owners (fig. 113). Household utensils had been placed on many

graves, and above them hung garments which were evidently tattered by long exposure.

The material culture of the people received attention and specimens have been added to the Ute collection in the National Museum. Notable among these are a set of grinding stones for corn, with specimens of corn, and of bread made by mixing the finely-crushed corn with water and baking it on heated ground, from which coals have been removed. Piñon nuts form a staple article of food among the Ute; some of these parched and still covered with the ashes in which they had been prepared, were added to the collection. Berries were gathered, dried, and prepared in various ways. Figure 115 shows the baskets used for this purpose, it being stated that the berries were placed in the smaller basket when picked, then emptied into the larger basket by passing it over the shoulder. Nets for trapping rabbits were woven from the outer bark of reeds, a specimen of this netting being made by a blind man. The frame used for this purpose and the manner of beginning the net are shown in figure 114.

Analysis of the Ute songs presents many striking contrasts to that of the Sioux and the Chippewa, in which connection it is interesting to note the difference in the environment of these tribes, as well as in their temperament and tribal history. It is not unlikely that all these may have affected the form assumed by the musical expression of these several peoples.

ETHNOLOGICAL RESEARCHES IN OREGON AND WASHINGTON

On July 19, 1916, Dr. Leo J. Frachtenberg left Portland, Oregon, where he spent the preceding winter and spring in the preparation for publication of the Alsea texts and traditions that were collected by him in 1910 and 1913. On that day he proceeded to the Quileute reservation, situated at Lapush, in the northwestern part of Washington, with a view of making an exhaustive study of the ethnology of the Quileute Indians who, with the now extinct Chinakum, form the so-called Chimakuan linguistic family. This work was carried on during August, September, October, November, and December. The most voluminous data were obtained, and the investigation was facilitated by the fact that the Quileute Indians, numbering approximately 300 individuals, live together in a single village and still cling tenaciously to their native language, and to their former customs and traditions. Consequently, Dr. Frachtenberg encountered little difficulty in collecting exhaustive data on the various phases of the ethnology of these Indians, and he succeeded in thoroughly investigating the following phases: Early History



FIG. 116.—View of the Quileute Reservation at Lapush, Washington.
Photograph by L. J. Frachtenberg.



FIG. 117.—James Island, former principal village of Quileute Indians at
Lapush, Washington. Photograph by L. J. Frachtenberg.

and Distribution, Manufacture (including Basketry, Matting, Weaving and Netting), Houses and Households, Clothing and Personal Adornment, Subsistence (including Hunting, Fishing, Sealing, and Whaling), Travel, Transportation and Trade, Warfare, Games and Pastimes, Social Organization and Festivals, Ceremonials and Societies, Pregnancy, Birth, Childhood, Twins, Puberty, Customs regarding Women, Marriage, Burial Ceremonies, Religion (including Conception of the World, Country of the Souls, Prayers and Observances, Guardian Spirits, Beliefs regarding the Soul, Shamanism, Ethical Concepts and Teachings), Medicine, Surgical Operations, Charms, Current Beliefs, Physical and Mental Traits, Decorative Art, Music and Dancing. This material is contained in 8 volumes numbering approximately 600 manuscript pages. In addition, Dr. Frachtenberg obtained several hundred native drawings and took photographs of some 150 specimens of material culture. He also added considerably to his previous collection of Quileute traditions, by collecting additional 22 native myths and traditions (in Quileute) and 3 narratives in English. These myths and tales comprise 200 pages. Furthermore, Dr. Frachtenberg succeeded in inducing two inhabitants of Clallam County, Washington, to present to the National Museum their valuable collections of Quileute baskets and specimens. These collections contain over 200 baskets, two carved house-posts, and approximately 25 specimens illustrating the material culture and ceremonial life of the Quileute Indians.

The comprehensive study of the ethnology and language of the Quileute Indians, conducted by Dr. Frachtenberg during the calendar years 1915 and 1916, has brought out some very important points, a few of which may be mentioned here in passing. Unlike the other tribes of the Pacific Coast, the Quileute Indians are not a vanishing tribe. On the contrary, these Indians are gradually, though slowly, increasing. Although since 1883 they were subjected to 5 separate epidemics of measles, smallpox, whooping cough, and grippe, their number has increased during that period by more than 10 individuals. The proportion of half-breeds among them is exceedingly small, and they are undoubtedly the most moral and law-abiding tribe of that area. This condition seems to be due to their complete isolation from the other tribes and from the white people, and to their persistence in adhering to the former customs and beliefs. A good proportion of these Indians are members of the Shaker Church, whose chief doctrine is total abstinence from gambling, smoking, and liquor. Up to about 4 years ago the Quileute still hunted whales in the open sea. In former years whale-hunting



FIG. 118.—Types of Quileute canoes. Photograph by George C. Cantwell.

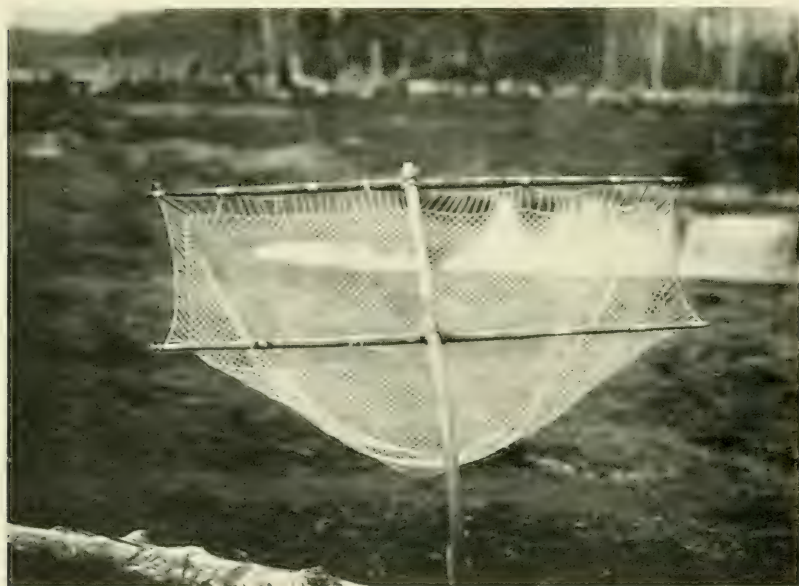


FIG. 119.—Quileute dip-net. Photograph by George C. Cantwell.

constituted one of their principal occupations, in which they were second only to the Makah Indians of Neah Bay. The daring, courage, and skill with which these primitive people hunted, attacked and killed the "Giant of the Sea" in their frail canoes and with their primitive weapons, must have been remarkable. At the present time pelagic hunting is confined to the hunting of the valuable fur-seals which constitute a not unimportant source of income to the Quileute. Last year alone they sold \$6,000 worth of furs. The Quileute learned the art of sealing some seventy years ago from the Ozette Indians, who in turn obtained it from the Nootka of Vancouver Island. In the meanwhile, the Ozette and Nootka have abandoned this occupation, partly voluntarily and partly owing to public interference, so that, to-day, the Quileute are the only Indians in the United States proper who are permitted to hunt and kill fur-seals. The Quileute use special canoes for that purpose; these canoes are dug-outs, made of cedar, and are manned by three people. The sealing season lasts from March until July, and the hunters very often go 30 and 40 miles out into the sea. The Quileute derive most of their revenue from the sale of the several species of salmon that are caught in the Quileute river.

A novel feature of American Indian ethnology has been found among these Indians in their former ceremonial life. Like the other tribes of the Northwest area, the Quileute had a number of secret societies, corresponding more or less to the fraternities of the Nootka, Kwakiutl, and Salish tribes, with this remarkable exception: All Quileute secret societies were occupational; that is to say, an individual became a member of a certain order, because he followed the profession of that order. Thus, Dr. Frachtenberg found special orders for Warriors, Hunters, Fishermen, Seal-hunters, Whale-hunters, Rain-makers, etc. The importance of this new phase of primitive social life cannot be overestimated. There can be no doubt that the culture of the Quileute Indians is closely related to the cultures of the Kwakiutl-Nootka and Salish groups. Furthermore, Dr. Frachtenberg is practically convinced that he will be able to produce conclusive evidence in the near future, showing that the languages of the Wakashan, Salish, and Chimakuan families have been derived from one common mother-tongue, which he proposes to call the *Mosan* language, from the numeral *mōs* "Four," which occurs, in one form or another, in all languages that constitute these three groups.

On October 12, Dr. Frachtenberg interrupted his Quileute field-work and proceeded to the Tulalip Reservation, Washington, where

for two weeks he assisted Dr. H. K. Haeberlin, of Columbia University, in his ethnological and linguistic researches among the Salish tribes. This trip was made at the suggestion of Prof. Franz Boas and met with the approval of the Bureau of American Ethnology.



FIG. 120.—Twined baskets of the Quileute Indians.
Photograph by George C. Cantwell.

The expenses of the trip were paid by Columbia University. Dr. Frachtenberg resumed his Quileute work on November 6, 1916, but interrupted it again on November 24, when he proceeded to San Francisco, Cal., for the purpose of conferring with Dr. A. L.

Kroeber, of the University of California, and with Mr. John P. Harrington, of the Bureau of American Ethnology, in regard to the relations of the researches of the Bureau of American Ethnology with those of the University of California, especially with respect to the ethnology and linguistics of the Indian tribes of northern and southeastern California and the adjacent regions. This conference took place on December 1 and 2, and a report embodying its results was sent to the Ethnologist-in-Charge of the Bureau of American Ethnology. While in San Francisco, Dr. Frachtenberg attended the meeting of the Pacific branch of the American Association for the Advancement of Science, reading four papers that dealt with the ethnology, mythology, and philology of the Indian tribes of Oregon and Washington. Dr. Frachtenberg returned to Lapush on December 9, resuming his Quileute field-work.

In the latter part of November it became evident that the appropriation granted Dr. Frachtenberg in the beginning of the fiscal year would not be sufficient to enable him to bring the field-work among the Quileute to a successful conclusion. Fortunately, an offer for cooperation was received from Columbia University, through the courtesy of Prof. Franz Boas, whereby Dr. Frachtenberg was enabled to continue his field-work. The Bureau accepted this offer, with the understanding that Dr. Frachtenberg would devote this sum to a comprehensive study of the music of the Quileute Indians, with special reference to the problem of song-variation. Dr. Frachtenberg is, at the present writing, conducting this investigation. He expects to collect about 80 songs, taking down the tune, burden, and translation of each song and obtaining the identical songs at separate times by the same and by distinct individuals. Dr. Frachtenberg expects to complete this work by the latter part of January, 1917, and will then return to Washington.

STUDIES AMONG THE INDIANS OF CALIFORNIA

Mr. John P. Harrington, ethnologist, was engaged during the year in continuing his exhaustive study of the Chumashan Indians of the Santa Barbara region of California. January was spent at Berkeley, Cal., where linguistic and historical manuscripts in possession of the Bancroft library were copied and studied, through the courtesy of the University of California. In the course of the summer this material was thoroughly worked over, transliterated, and corrected with the aid of Indian informants.

At the end of January Mr. Harrington returned to the Southwest Museum, Los Angeles, where he spent the months of February and

March in work on the Ventureño dictionary, which already covers about 8,000 cards and has served as the basis for similar dictionaries which have been started for the other dialects. The entire summer was devoted to an intensive study of the Barbareño, Ineseño, and Purismeño dialects. The supposedly extinct Purismeño is now represented by a vocabulary of several hundred carefully written words and phrases. This work was followed by a month's further study of the Obispeño dialect, beginning September 16. More and better material was obtained than previously. The informant's health being such as not to admit of long or steady hours of work daily, there was opportunity to memorize every word and to digest the material thoroughly as it was presented.

The period from October 14 to November 15 was spent at the Southwest Museum, Los Angeles, in elaborating the notes, and the remainder of the year in field-work on Ventureño, correcting, improving, and adding to the previous notes.

Some of the interesting features of language and culture discovered in Mr. Harrington's studies have been: the use of vowel triplication as a unique grammatical process; a system of relationship terms which extends to the fourth generation (for example, great-great-grandparent, great-great-grandchild, and not merely to the third as with most tribes); the use of sun shrines and their renewal at the coming of the new year; the use of one word for world, year, and God; the use of seaworthy board canoes (fragments of these taken from excavations and now at the Southwest and other museums not hitherto having been recognized as such); the institution of berdaches as undertakers; the erection of tall poles hung with property on the graves of rich persons; the identification of the site of "Pueblo de las Canoas" of early Spanish narratives, and that the Ventureño name for it was Shisholop, meaning "the mud." In connection with this last determination it is interesting to note that the surrounding tribes called Ventura the "mud place" and the Ventureños the "mud people."

WORK AMONG THE OSAGE INDIANS

During the year 1916, Mr. Francis La Flesche, ethnologist, visited the Osage reservation in Oklahoma for the purpose of continuing his researches among the people of that tribe. While changes are continually taking place in the religious institutions of these people, many of the full-bloods still believe in the ancient rites and retain the practices that have grown out of them.

After considerable difficulty Mr. La Flesche prevailed upon Shoⁿgemoⁿiⁿ, one of the oldest members of the tribe, to recite two



FIG. 121.—Shon'gemonin, an Osage No'houzhiŋga.

rituals belonging to his gens, the Tsi'zhu Washtage, namely, the ceremonial naming of a child of the gens, and the initiation of a young man into the mysteries of the war rites. A portrait of Shoⁿgemoⁿiⁿ is here given (fig. 121).

The ritual of the ceremonial naming of a child belonging to the Tsi'zhu Washtage gens is the second ritual of this rite that Mr. La Flesche has succeeded in recording since commencing his study of the Osage tribe. The first obtained is the ritual used by the Puma gens, whose gentile function is to conduct the principal parts of the war ceremonies; the second ritual procured is that of the Tsi'zhu Washtage gens whose duty it is to take part in the ceremonies connected with the hunt. This gens is one of the two gentes to which belong the hereditary office of chief, and it is also a peacemaker gens. These two rituals of the child-naming ceremony comprise 107 type-written pages and will form a chapter in the forthcoming memoir on the Osage tribe. Many of the full-bloods still cling to the idea that a child who has not been ceremonially named has no place in the tribe as a person, and that it is only through the rights acquired at this naming that the child on attaining manhood can command the respect of other members of the tribe. In these child-naming rituals the gentile symbols are clearly set forth.

The second ritual obtained during the year from Shoⁿgemoⁿiⁿ, *i. e.*, the initiation of a young man into the mysteries of the war rites, bears the title of Noⁿzhiⁿzhoⁿ Wathoⁿ, which signifies, "the fasting songs." These relate to the rite of fasting which the chosen leader of a war party takes upon himself in order to excite the compassion of Wakoⁿ'da and thereby enlist the aid of that power in winning success.

The Noⁿhoⁿzhiⁿga of the Tsi'zhu Washtage gens always render their version of this ritual with an air of reluctance, the reason being that the office of this gens is to protect life, even that of a caterpillar that happens to stray into the chief's house. During the ceremonial approach to the Sacred House the song and the wi'gie sung and recited have no references to war or to valorous deeds, but to the path of life in which all must strive to travel in peace. In the Noⁿzhiⁿzhoⁿ, or fasting ritual, of the other gentes there is a wi'gie that explains the significance of the rattle used in the ceremony, one that relates strictly to war. But as it has to be included in the fasting rite of the Tsi'zhu Washtage gens, when they recite it they omit the authoritative refrain at the end of each line, *a biⁿ da, tsi ga*, ("it has been said, in this house"), for the reason that war was not taught in the Sacred House of the Tsi'zhu Washtage; but as the

Noⁿhoⁿzhiⁿga are obliged to use this wi'gie, they changed the words of the refrain to *a bi a*, ("they said," that is, they of the House of the Hoⁿ'ga). Furthermore, the entire wi'gie is recited in a very low tone so that only the Xóka and the candidate can hear the words.

The task of transcribing the text of the ritual as recorded by the graphophone, and the translating of the wi'gie and the songs is still in progress. At the present time 30 typewritten pages have been completed.

The rigidity with which the Tsi'zhu Washtage gens in its rituals adheres to the peace principle it represents may be regarded as being theoretical rather than an actual restriction of warfare, for the reason that among its members there have been men who have won war-honors and who have even been leaders of war-parties. Shoⁿ'gemoⁿiⁿ himself is an example of this, for he has won more than the number of war-honors required for the ceremonial counting of *odoⁿ'*; he has often been chosen to act as Wádoⁿbe, the counter of war-honors, at the war ceremonies.

Shoⁿ'gemoⁿiⁿ recounted in the phonograph for Mr. La Flesche his thirteen war-honors, giving them exactly as he counts them at the war ceremonies. For this service he is usually paid from one hundred to one hundred and twenty-five dollars when he fills the office of Wádoⁿbe. It was as an act of friendship to Mr. La Flesche that he made, for a small sum, the record of his counting of *odoⁿ'*.

This record by Shoⁿ'gemoⁿiⁿ has been included in the already completed Noⁿ'zhiⁿzhoⁿ ceremony as described by Waxthi'zhi of the Ingthoⁿga gens. The reason for placing it there is that, according to tribal regulations, Shoⁿ'gemoⁿiⁿ cannot be chosen to act as Wádoⁿbe on his side of the tribal division, but must be called upon from the opposite side to perform this ceremonial act.

In 1863 Shoⁿ'gemoⁿiⁿ took part in a fight in which the Osage warriors destroyed a party of Confederate officers who were on their way to Mexico. In the struggle he struck some of the men, "but," he added, "I do not recount these strokes at the war ceremonies because I am a friend of the white people."

Shoⁿ'gemoⁿiⁿ is one of three surviving old men of the tribe who can count the full thirteen *odoⁿ'*, or war-honors, at the war ceremonies.

ETHNOLOGY OF THE IROQUOIS

On April 19, 1916, Mr. J. N. B. Hewitt resumed his field studies of the League of the Iroquois, near Brantford, Ontario. His time was devoted chiefly to the collection of native texts, largely in



FIG. 122.—The Black God of Disease and Death: One of three Disease Gods of the Iroquois.

Mohawk, Onondaga, and Cayuga, and as far as practicable interlinear and free translations and expository interpretations in English were also obtained for these texts. This material is being prepared for his projected memoir on the League of the Iroquois or Five Nations. The subject-matter is complex and difficult to understand. It deals with the laws and ordinances, the rituals, the addresses, the chants, the songs, and the traditions of origin, of the League as an institution, which still exists best among the Six Nations of Iroquois in Canada. The very technical and highly figurative diction of the native material is not in most cases understood by the ordinary native speaker, and so it is necessary to test the knowledge of an informant or interpreter before accepting his or her services; even such information must be revised and compared with other sources of information. This is not at all strange, because the native life is being gradually displaced by the culture of European peoples.

These texts embrace a very wide range of subjects—laws, ordinances, decisions as to the meaning or applications of laws, rituals, ceremonies, and constitutional principles—often stated in technical and highly metaphorical terms derived from mythic and legendary sources. The tradition of the parthenogenetic conception and birth of Dekanawida and of his work in establishing the League of the Five Nations diverges into several versions which have adopted striking, though often contradictory, incidents from the legendary and mythic lore of the people. The most noteworthy of these incorporations is the Saga of the Wrath of Hiawatha. So, to obtain a fair understanding of the entire subject it becomes imperatively needful to collect these varying versions, no matter how fragmentary they now may be, for the purpose of providing means for disentangling the probable historical nucleus of the original saga from these variant stories. It must be kept constantly in mind that no small proportion of these ancient laws and ordinances—now largely in abeyance—are recoverable only from the language of the chants and songs and addresses of the Condoling and Installation Council.

Thus the work of recording these native texts dealing with the most highly developed and complexly organized activities of these tribes is most tedious and irksome, and one of some difficulty, because of the highly-wrought diction of these narratives and rituals and because the native annalists of these tribes, whose knowledge of the history and wisdom of their past was unmodified by European culture, are no more, and also because their sons and daughters of to-day have become interested largely in other things, and so they have forgotten, if they ever had learned, the lore and the wisdom



FIG. 123.—Mask of a Corn Goddess of the Iroquois.

of their ancestors. These things do not interest the great majority of persons as they did their ancestors ; and as it is absolutely essential that correct lexical and grammatic forms be recorded and expounded it is found a very difficult matter to secure trustworthy informants and interpreters. Inability to translate the meaning of the native vocables into equivalent English words is the greatest bar to the student in the acquirement of a consistent knowledge of the structure of the League and of its constituent institutions. Too pronounced personal views and fanciful preconceptions often render an informant's work useless.

A most important result of Mr. Hewitt's work in the field is the finding of conclusive evidence that the number of federal chiefs of the League of the Iroquois was originally forty-seven, which later by the addition of two recalcitrant Seneca chiefs was raised to forty-nine. The number fifty has appeared in all available written records and printed accounts of the League chiefs. This number has never been questioned hitherto but has been accepted as historical. The supernumerary chiefship, it is learned, was unwittingly added by Thomas Webster, a chief of the New York Onondaga, more than fifty years ago, through a misunderstanding of the meaning of the " Bear-Foot " episode of the ancient time and the significant action of the Federal Council of the League of the Iroquois, with reference to it. This false Websterian interpretation gained credence only after the dissolution of the integrity of the League of the Iroquois following the treaty of 1838 with the United States, which had the effect of permanently dividing the several tribes.

The famous " Six Songs " of the Condoling and Installation Council of the League of the Iroquois were first translated, so far as known, into English for Mr. Horatio Hale (" The Iroquois Book of Rites," 1883) by Chief John " Smoke " Johnson, who is there described as " the only man now living who can tell the meaning of every word of the ' Book of Rites.' " Yet, they were erroneously translated as " Songs of Greeting and Welcome." But on grammatic grounds and from their position in the ritual Mr. Hewitt has decided, tentatively at least, to translate them as " Songs of Parting " or " Songs of Farewell," which are so dramatically sung, therefore, in behalf of the dead chieftain.

The Dekanawida legend rehearsing the story of the founding of the League of the Five Nations, as told by the Mohawk and Onondaga annalists, is largely repudiated by the Cayuga wisemen now living. And there appear to be some grounds for their doctrine. So Mr. Hewitt recorded a Cayuga version of the so-called



FIG. 124.—Small drums for the Onchowih dances of the Iroquois.



FIG. 125.—Figure at top, medicine flute; two bottom figures, knee-rattles of deer hoofs. Iroquois.

Dekanawida legend, in which the great statesman is anonymous. In this interesting version Dekanawida is known throughout the account by the descriptive title, "The Fatherless," or literally, "He

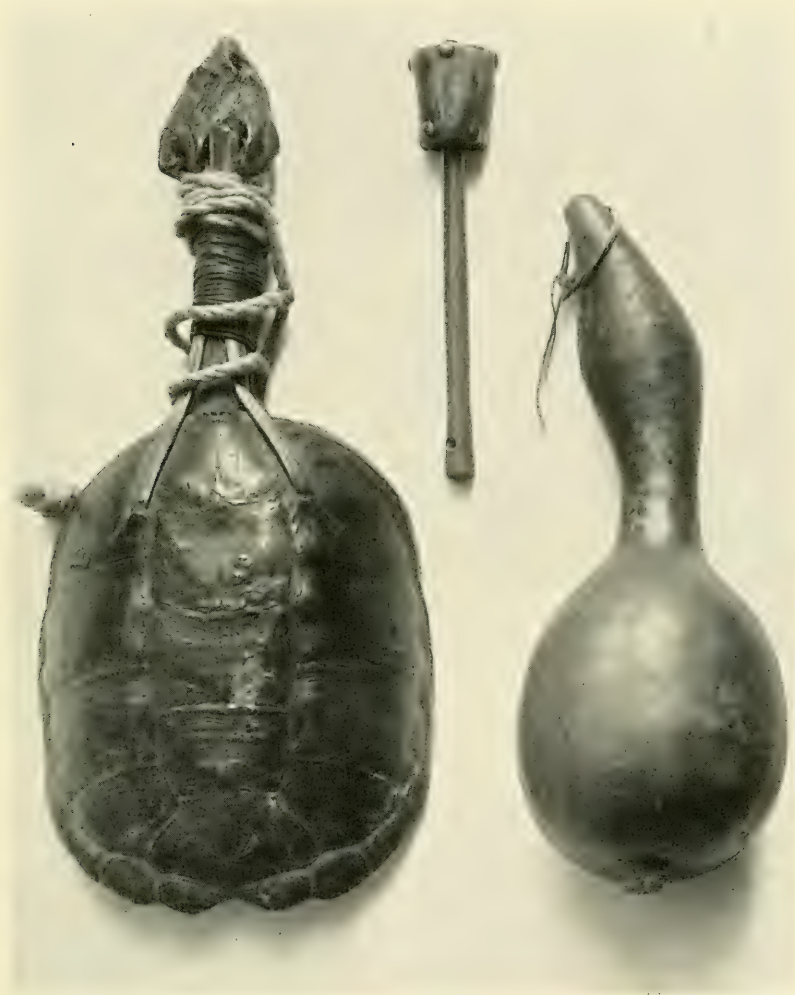


FIG. 126.—Turtle-shell rattle, horn rattle, and gourd rattle of the Iroquois.

Who Is Fatherless." This title was designed probably to emphasize a prophecy that he would be born of a virgin by an immaculate conception. This Cayuga version was dictated by Chief John H.

Gibson of the Cayuga tribe, a son and disciple of his great father, the late Chief John Arthur Gibson of the Seneca tribe. In this account "The Fatherless" is represented as having established among the Cayuga people a form of civil government, the exact type of which he later in life founded among the Five Iroquois tribes, inclusive of the Cayuga. It is stated that the Cayuga statesmen did not realize the suitability of that form of government to the affairs and welfare of all men, and so they had limited its scope and benefits selfishly to their own Cayuga people. And this account relates that because of this bad stewardship on the part of the Cayuga people it became needful for "The Fatherless" to return "from the sky" to the neighbor tribes of the Cayuga for the purpose of establishing among them the League of the Five Nations of the Iroquois, of which he declared all the tribes of men should be co-equal members.

Further, in this account there is an attempt to explain the origin of the obtrusive dualism which appears as the basis of all public institutions of the Iroquois peoples. According to this explanation this dualism arose merely from an alleged agreement between two Cayuga persons who were related the one to the other as "Father And Son," or better, as "Mother And Daughter," to transact public affairs jointly from opposite sides of the Council Fire. It is seen that this explanation seemingly does not account satisfactorily for the occurrence of similar dualisms among other peoples. The most satisfactory explanation of this phenomenon is one proposed by Miss Alice C. Fletcher and Mr. Hewitt, although working independently, a number of years ago, namely, that this dualism is, in brief, a dramatization of the relation of the male and the female principles of nature in the forms of governmental organization.

Mr. Hewitt also recorded in the Onondaga dialect a brief legend describing the three Air- or Wind-Man-beings, or Gods; these Gods are the so-called Hoñdu'i, the patrons of the Wooden-Mask With the Wry-face or "False-face" Society, whose duty is the exorcism of disease and sickness from the community and from the minds and bodies of the people; also a short story of the Medicine Flute; and another on the Husk-Mask Society; and another on the Moccasin Game as Used at the Wake for a Dead Chief; these texts aggregate more than 175 pages of manuscript exclusive of the materials relating to the League.

A number of fine specimens illustrative of Iroquois culture were procured; these objects show a high order of art, and they consist of one wooden mask, colored black (fig. 122); a husk mask for a

Medicine Society (fig. 123); two small drums (fig. 124); a "medicine" flute (fig. 125); a pair of deer-hoof knee-rattles (fig. 125); a horn-rattle, a turtle-shell rattle, and a gourd rattle (fig. 126).

At the close of June, 1916, Mr. Hewitt was still on field duty; up to this time, he had read, revised, studied, and annotated about 8,000 lines of text other than material mentioned in the closing paragraphs of this statement. He also made a number of photographs of Indians.

ETHNOLOGICAL WORK AMONG THE SAUK, FOX, AND PEORIA INDIANS

The first part of June, 1916 found Dr. Truman Michelson among the Sauk and Fox of Iowa. The main work accomplished was the phonetic restoration of a long text, written in the current syllabary, on the origin of the White Buffalo Dance, which is intended as a future bulletin of the Bureau. He secured several sacred packs for the Museum of the American Indian (Heye Foundation), of New York, under the agreement that the Bureau should retain the right to publish the information pertaining to them. In this way more information on these difficult topics was obtained, and more is expected. Other ethnological data, especially sociological, was also acquired. About the middle of August Dr. Michelson proceeded to Oklahoma, where, under the joint auspices of the Bureau of American Ethnology and the Illinois Centennial Commission, he conducted researches among the Peoria. Their ethnology properly speaking has practically vanished, and although their language and folklore still persist, knowledge thereof is confined to a very limited number. The phonetics of the Peoria language, contrary to ordinary belief, is extremely complicated. As surmised from the notes left by the late Dr. Gatschet, Peoria linguistically belongs fundamentally to the Ojibwa group of Central Algonquian languages; yet at the same time it is clear that there has been another and more recent association with the Sauk, Fox, and Kickapoo group. A study of Peoria folklore and mythology also points to this double association, as does the system of consanguinity, which agrees with Sauk, Fox, and Kickapoo, as opposed to Ojibwa, Ottawa, Algonkin, and Potawatomi. It should be noted that Peoria folklore and mythology contain a number of Plains and Plateau elements which thus far have not been recorded among other Central Algonquian tribes. How these elements spread eastward is as yet unknown. A number of strictly aboriginal tales were collected that have not been recorded elsewhere. A large number of European tales have been incorporated, and

yet the Peoria Indians are unaware of their origin. While among the Peoria some incidental notes on Shawnee sociology and folklore were obtained by Dr. Michelson. After about four weeks' stay in Oklahoma he returned to Iowa to renew his investigations among the Sauk and Fox at Tama. There the phonetic restoration of a number of texts on minor sacred packs pertaining to the White Buffalo Dance was accomplished, and about 200 pages of the extremely long myth of the Fox culture-hero were also restored. Dr. Michelson witnessed most of the ceremonies that



FIG. 127.—Some of the descendants of the Fox Chief Poweshiek.

were performed when the Potawatomi of Wisconsin presented the Foxes with a new drum of the so-called "Religion Dance."

RESEARCHES BY DR. JOHN R. SWANTON

The only undertaking in the nature of field-work by Dr. John R. Swanton during the year was a visit to Chicago in September to make an examination of the manuscript material in the Ayer collection of Americana in the Newberry Library. This occupied less than a week, but proved rich in results, the most important of which was the discovery of a French memoir containing the best Karankawa

vocabulary so far known and the only known vocabulary of Akokisa. A photostat copy of this was secured later, and similar copies of several other original manuscripts or copies of originals: one a second French memoir giving a considerable account of the Choctaw Indians, and censuses, town by town, of both the Choctaw and the Creeks, another an enumeration of the Louisiana Indians, apparently by Bienville, and a third a Spanish census of the Indians in Florida in the early part of the eighteenth century, which includes the town, the name of each Indian, and his approximate age. This library also preserves what appears to be the original manuscript from which the *Mémoires Historiques sur La Louisiane* of Dumont de Montigny was composed. On the basis of the material enumerated it is now possible to classify exactly the little known Akokisa, Washa, and Chaouacha tribes, and to add considerably to our knowledge of the Indians north of the Gulf of Mexico in other particulars.

VISIT TO THE CHEROKEE INDIANS

Owing to impaired health the field-work of Mr. James Mooney in 1916 was confined to a visit of about ten weeks (May 28-August 10) to the old Cherokee country in western North Carolina, during which time he visited the principal Indian settlements and railroad towns and added to his information on the tribal folklore, besides securing several important documents bearing on the participation of the Cherokee in the Confederate service during the Civil War.

SOLAR RADIATION OBSERVATIONS AT MOUNT WILSON

The Smithsonian Astrophysical Observatory has a station at Mount Wilson, California, on ground leased from the Mount Wilson Solar Observatory of the Carnegie Institution. In 1916, as in former years since 1905, observations of the intensity of solar radiation were made there during the months June to October by Messrs. Abbot and Aldrich.

In the course of the research, now continued for more than a decade, the variability of the sun has been definitely proved. Expeditions for checking Mount Wilson results were conducted to Algeria in 1911 and 1912, and simultaneous measurements in California and Algeria confirmed the reality of the suspected variations of the sun. Further confirmation was obtained at Mount Wilson in 1913, and subsequently. For it was found that the distribution of brightness over the solar disk is variable in association with the sun's total radiation. Not only does the sun's radiation fluctuate

from day to day, but the average values found in a whole season's work, vary from year to year.

It was primarily to continue and amplify these studies of the solar variability that the observing was done on Mount Wilson in 1916. Both the total radiation of the sun and the distribution of brightness over the solar disk were measured on as large a number of days as possible. Owing to considerable cirrus cloudiness in June and August, a dense haze suggesting the volcanic haze of

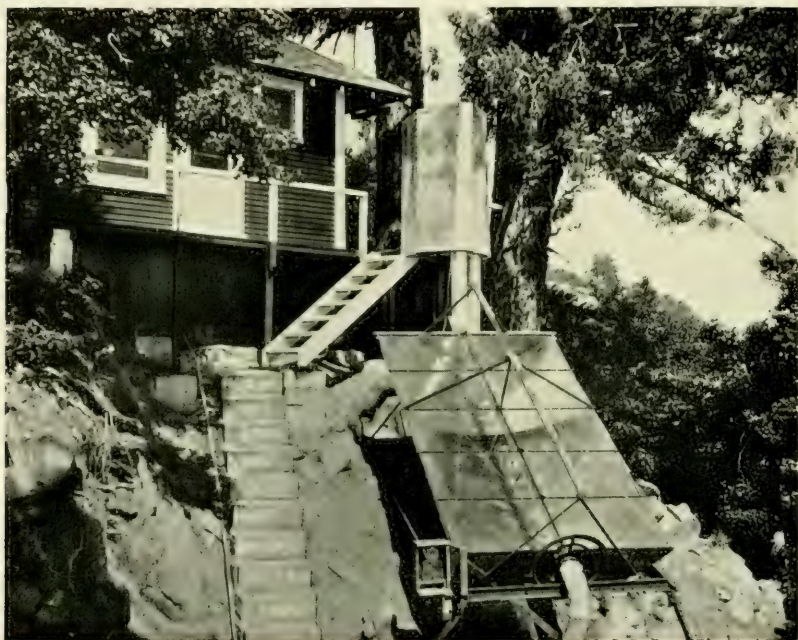


FIG. 128.—Observers' cottage and solar cooker, Mount Wilson, California.

1912 in late July and early August, and to heavy rains in late September and early October, the season proved less favorable than usual, but nearly 100 days of observation were secured. Full reduction of the observations must be awaited before noting the solar changes during the season, but generally high values of solar radiation seemed to prevail, as was expected in view of numerous sun-spots. At one time in June nearly 100 spots were seen on the sun's image. Large magnetic disturbances were associated with this spot outbreak, and observations had to be suspended on one day because of them.

As the sun is the ruler of the earth's temperature, and his rays the dependence of all vegetation, solar fluctuations of five, or even sometimes ten per cent, such as have been discovered in these studies must be important. Great need is apparent of checking and completing the Mount Wilson work at other favorable stations. In 1914 Mr. Abbot went to Australia and urged the erection of an observatory for the purpose there, but owing to the outbreak of the war, the Government, though favorably inclined, was unable to take the matter up. Fortunately it has recently become possible for the Smithsonian Institution itself to undertake the support of a station in South America for observing solar radiation, and this is expected to be installed in July, 1917 by Mr. Abbot. It is hoped to make the solar radiation observations every day in the year hereafter either at Mount Wilson or in South America or at both stations.

Further work was done with a solar cooking appliance at Mount Wilson in 1916, but owing to the delay until September of materials ordered for it and expected in April, no satisfactory tests have yet been made. Food was cooked in 1915, including meat, potatoes and other vegetables, and cereals. It is confidently expected to bake bread also when the apparatus is done.

A great drawback to the solar work done hitherto has lain in the tarnishing of the silvered mirror surfaces used to reflect the sun rays onto the bolometer. This is the more serious because it affects rays of different colors differently. Violet and ultra-violet rays are most weakened by the tarnishing of silver. At last a new alloy "stellite" has appeared which does not tarnish, even if exposed for months to sun, rain, snow, and smoke. Two stellite mirrors for the spectrobolometer were introduced on Mount Wilson in 1916, along with a vacuum bolometer of greatly increased sensitiveness. It is now hoped to determine definitely whether all rays of the sun wax and wane in their intensity proportionally, as the sun varies, or increased solar radiation is preponderatingly associated with special regions of the spectrum.

Comparisons were made in 1916, of the pyrhelimeters used daily in Mount Wilson work with the standard waterflow pyrhelimeter. The results showed that no detectable change of the sensitiveness of the secondary pyrhelimeters has occurred. We may be confident that the entire series of observations at Mount Wilson, from 1905 to 1916, is expressed on a constant scale of radiation to within one per cent. Numerous and varied measurements show also that this constant scale is the true standard scale of measurement whose

unit is the calorie. About thirty standardized silver disk pyrheliometers have been sent out by the Smithsonian Institution at cost, so that this same scale of measurement is now available in many countries, including Canada, United States, Mexico, Peru, Brazil, Argentina, Philippines, Java, Teneriffe, Spain, Italy, France, England, Germany, and Switzerland.

A new instrument, the "pyranometer," adopted for measuring the brightness either of the sun alone, the sun and sky, the sky alone, or the nocturnal radiation of a blackened surface to the whole sky, has been perfected and was much used at Mount Wilson in 1916. This instrument is suitable for measuring the intensity of light where plants grow, whether in full sunlight or deep shade. Its results agree accurately with the standard scale of radiation mentioned above.





